PRELIMINARY INSTRUCTION BOOK

FOR

RADIO TRANSMITTER BC-797-A, BC-797-B
REMOTE CONTROL UNIT RM-31-A, RM-31-B
ASSEMBLY – AIRDROME CONTROL EQUIPMENT
TYPE 201-A U.H.F. AIRPORT RECEIVER

MANUFACTURED BY

RADIO RECEPTOR CO., INC.

PUBLISHED BY AUTHORITY
OF
THE CHIEF SIGNAL OFFICER

Order No. 10472 - Phila - 42
Order No. 1528 - Phila - 43
Order No. 14471 - Phila - 43

ADDENDA TO PRELIMINARY INSTRUCTION BOOK

FOR RADIO TRANSMITTER BC-797-A, BC-797-B

A. In some cases it will be found that following the tuning procedure outlined in paragraph 18 of this instruction book will result in excessive P.A. grid current under operating conditions.

The P.A. Grid current should not exceed 15 milliamperes. In those cases where the P.A. Grid does exceed 15 milliamperes, it should be reduced in the following manner.

1. Tune up the transmitter completely by the procedure outlined in paragraph 18. Ignore the fact that the P.A. Grid current is excessive, and follow the normal procedure.

2. With the transmitter tuned up completely and ready for operation, set the multimeter switch on P.A. Grid; set the Tune-Operate switch on Operate; gently turn the 3rd Multiplier Grid dial in either direction, until the reading on the multimeter is 15 ma. (P.A. Grid) DO NOT TOUCH ANY OTHER DIAL SETTING. The adjustment you have just made has not adversely affected the operation of the transmitter.

3. The procedure may then be continued as described in paragraph 19.

B. In most units of Radio Transmitter BC-797-A and in all units of Radio Transmitter BC-797-B, an additional resistor (R-40, 75,000 ohms, 1 watt, ±20%) has been inserted in series with the grid of tube V-10 (Audio Amplifier 6J5). Its purpose is to keep R. F. from entering the audio system at that point.

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N O T I C E

There are three sets of instructions bound in this bulletin.

The first section covers:

Radio Transmitter BC-797-A(B)
Remote Control Unit RM-31-A(B)

The second section covers:

Assembly-Airdrome Control Equipment

The third section covers:

Type 201-A U. H. F. Airport Receiver

W A R N I N G

THE VOLTAGES APPEARING IN THIS EQUIPMENT ARE DANGEROUS TO LIFE

DO NOT depend upon the action of door interlock switches for safety. Disconnect all AC Line voltages before making repairs or adjustments within the cabinet.

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PRELIMINARY INSTRUCTION BOOK

Radio Transmitter, BC-797-A (B)
Remote Control Unit, RM-31-A (B)

I. GENERAL DESCRIPTION

1. PURPOSE.

Radio Transmitter BC-797-A(B) and Remote Control Unit RM-31-A(B) are intended for use in the control of airport traffic.

2. POWER

a. Input. The transmitter and remote control unit require a 115 volt, 60 cycle, single phase power source.

b. Output. The transmitter has a nominal output rating of 50 watts (unmodulated carrier).

3. MODES OF OPERATION

This equipment may be operated as follows:

a. To transmit speech using the Transmitter BC-797-A(B) unit only.

b. To transmit speech from a remote point using Transmitter BC-797-A(B) and Remote Control unit RM-31-A(B).

4. FREQUENCY RANGE

The transmitter is designed to transmit at any frequency in the range 116 to 126.25 megacycles, when used with a suitable quartz crystal (1/27 of carrier frequency.).

5. USE

Transmitter BC-797-A(B) and Remote Control unit RM-31-A(B) may be used for two-way communication between airport and aircraft, when used in conjunction with the following additional equipment at the ground station.

a. An antenna and ground system.
b. One or more radio receivers.
c. One or more loudspeakers.
d. Two pairs of telephone cable.

6. WEIGHT and VOLUME

The approximate weights and dimensions of the transmitter and remote control unit are as follows:

Unit	Weight	Dimensions
Transmitter BC-797-A(B)	430 lbs.	29 1/16"wide, 43"high, 21"deep
Remote Control Unit RM-31-A(B)	28 lbs.	19"wide, 7"high, 9 3/16" deep

7. TABLE OF OPERATING CHARACTERISTICS

Power Supply	110-120 v., 60 cycle single phase
Power Input, Unmodulated	690 watts
Power Input, 100% Modulated	750 watts
Unmodulated Carrier Output	45 watts
Output Frequency	116 to 126.25 mc.
Antenna Load Impedance	72 ohm concentric transmission line
Permissible Modulation	100%
Distortion of 1000 cycles at 90% modulation	less than 7%
Distortion of other frequencies at 90% modulation	less than 12%
Freq. Response from Line Input	±1 db. from 100 to 3000 cycles
Operating Temperature Range	-15 to +50° C.
Operating Humidity Range	0 to 100%
Carrier Noise With Audio Input Shorted and Gain Control at Maximum.	less than 2%
Effective operating range	To the horizon-- depends on height of transmitting and receiving antennas.

8. MAJOR COMPONENTS

The major components of this equipment are:

a. One Radio Transmitter BC-797-A(B).
b. One Remote Control Unit RM-31-A(B).
c. Two microphones, Kellogg Type T-32.
d. One set of spare parts.
e. Two sets of vacuum tubes.
f. Also required, BUT NOT SUPPLIED--Quartz crystal mounted in FT-164 Holder, with a frequency 1/27 of desired carrier frequency.

9. MECHANICAL CONSTRUCTION RADIO TRANSMITTER (BC-797-A(B)

a. The transmitter is housed in a steel, black wrinkle finished cabinet equipped with one rear and two front doors. The two front doors do not completely cover the entire front panel, but leave a recessed vertical strip at the center approximately one third the width of the entire front surface. On this center portion are mounted all controls, switches and meters normally used in routine adjustment and operation. Any one of the doors may be opened independently of the others, but opening any door will open interlock switch which will immediately remove the plate voltages. Opening the front doors provides access to some of the interconnection terminal strips, the relays, fuses, circuit breakers and chassis wiring. Opening the rear door provides access to the remaining interconnection terminal strips, the input and output terminals, all tubes, transformers, condensers and the entire RF chassis. Each door is equipped with a handle which actuates a double catch bar and locks the door. The transmitter housing contains the following units.

(1) From the front of transmitter

(a) Power unit (upper left)
(b) Audio unit (upper right)
(c) Fuse and Breaker unit (lower left)
(d) Relay unit (lower right)
(e) Radio frequency unit (top center)
(f) Control unit (bottom center)

(2) Inside the housing (viewed from rear)

(a) Plate automatic voltage regulator (left side)
(b) Filament " " " (right side)
(c) Main high voltage plate transformer (bottom)
(d) Main high voltage filter choke (bottom)
(e) Automatic voltage regulator condensers (bottom)
(f) Antenna transmission line coupling (top right)

b. Opening the rear door permits:

(1) Change of tubes
(2) Change of crystal

(3) Adjustment of neutralization
(4) Connection of telephone lines, power lines and ground.
(5) Connection of antenna transmission line.

c. Opening of the left front door permits:

(1) Opening and closing of circuit breakers
(2) Replacement of main line fuses

d. Opening of right front door permits:

(1) Adjustment and replacement of relays

e. Air blowers are provided which pull air in at the bottom front of the housing through air filters and blow it out at the top sides through louvres. One blower is mounted on each of the lower left and lower right chassis.

10. MECHANICAL CONSTRUCTION - REMOTE CONTROL UNIT RM-31-A(B)

a. The remote control unit is assembled on a standard 19"x7" relay rack panel and chassis. A dust cover and bottom chassis cover are provided. Terminals are at the rear together with a fuse holder and an AC power receptacle.

b. Mounted on the front panel are three power switches and pilot lights, a modulation meter, a modulation level control and a microphone jack. The three power switches perform the following functions, respectively:

(1) Turn ON local AC power supply.
(2) Turn ON filament and bias supply at the remote transmitter.
(3) Turn ON plate supply at the remote transmitter subject to the control of the microphone switch, at the remote control unit.

c. The dust cover may be removed by turning the knurled thumb screws at the rear and pulling the cover back. This will permit:

(1) Change of tube.
(2) Adjustment of relay.

II. EMPLOYMENT

11. LIMITATIONS

Transmitter BC-797-A(B) has the usual limitations possessed by a radiophone transmitter of the same power and frequency range. Some of the factors that influence the effectiveness of operation which can be controlled are:

a. Frequent inspection and correction of defects.
b. Accurate tuning.
c. Antenna location and height.
d. Percent modulation.

12. PACKING

a. Packing cases

(1) Packing case #1 is 51"x26½"x36½" and weighs 580 lbs. with contents.
(2) Packing case #2 is 21½"x36"x17½" and weighs 120 lbs. with contents.

b. Contents

(1) Packing case #1 contains:

(a) One Radio Transmitter, BC-797-A(B), less tubes and crystal.

(2) Packing case #2 contains:

(a) One Remote Control Unit, RM-31-A(B).
(b) Two sets of tubes.
(c) One set of spare parts.
(d) Two Kellogg Type T-32 microphones
(e) Two preliminary instruction books.

c. Method of Packing

(1) Transmitter BC-797-A(B)

(a) Radio Transmitter BC-797-A(B) is packed complete except for tubes, microphone and crystal.

(b) The antenna coupling coil and the beaded flexible leads are secured firmly in place with cotton tape to prevent damage due to vibration during transportation.

(c) Wooden cross pieces are bolted across Transformer T-5 and reactor X-3 at the rear of the cabinet in order to support the weight of the two voltage regulators mounted on the sides of the cabinet.

(d) The base of the cabinet is bolted to a wooden skid which forms the bottom of the packing case.

(e) The transmitter is packed in a layer of felt wadding and water proof paper.

(f) The top and sides of the packing case are nailed together and to the bottom skid to form a tightly fitting packing case.

(g) Three steel straps bind the case.

(h) The packing case should be transported in an upright position and is so marked.

(2) Remote Control Unit RM-31-A(B)

(a) Packed in the same case with the Remote Control Unit are six other cartons as enumerated in paragraph 12-b-2.

(b) The Remote Control Unit is packed in a carton and is braced by a crosspiece so that it cannot move.

(c) The packing case is strapped with steel bands.

d. Unpacking

(1) Case #1 Transmitter BC-797-A(B)

(a) CARE: Particular care must be exercised, when unpacking or handling the equipment, because it may be easily damaged when not protected by the packing case. Care must be exercised to prevent the application of pressure to the meter faces.

(b) Place the packing case as near its operating location as convenient.

(c) Cut the steel straps

(d) Remove the nails using a nail puller and remove the sides. PRYING THE SIDES OFF MAY RESULT IN INJURY TO THE EQUIPMENT.

(e) Remove the top and all protective wrappings.

(f) Remove the wooden braces from the transformers inside the cabinet.

(g) Remove the tape from the antenna coupling coil and from the beaded flexible leads.

(h) Remove the four bolts holding the transmitter case to the bottom packing skid. This procedure may be accomplished as follows:

Open rear door. At the bottom near the rear edge there are two bolts which hold the transmitter case to the bottom of the packing case (or skids). Remove these. There are two more bolts toward the front of the transmitter. These are located so as to fasten through an angle piece welded in the bottom of the cabinet just forward of transformer T5, and reactor X3.

The bolts project up through the skid and are held within the cabinet by nuts. Each of the four nuts is marked by white paint so as to be readily identified. They may be removed by using a socket wrench.

(i) Remove the transmitter from its case and place it near its final location.

(2) Case #2.

(a) Cut the steel bands around the case.

(b) Remove the nails using a nail puller and remove the top of the case. DO NOT PRY THE TOP AND SIDES OFF, AS THIS MAY DAMAGE THE EQUIPMENT.

(c) If necessary, remove the crosspiece.

(d) Lift the cartons out of the case carefully.

(e) Open each carton carefully and check its contents.

(3) Inspection

Inspect the equipment visually for damage after

removal from the shipping cases. If necessary, clean with a small brush or a blower.

13. INSTALLATION, RADIO TRANSMITTER BC-797-A(B)

a. If desired, fasten the transmitter cabinet to the floor or table using the four mounting holes in the bottom. Wood screws or lag bolts may be used.

b. Bring the two pairs of telephone wires into the cabinet using one of the 3/4" I. D. pipe nipples in the lower rear corners of the cabinet. Cover the ends of these wires with friction tape until the proper connections are determined.

c. Bring a single #14, or larger, insulated copper conductor from the nearest ground through one of the pipe nipples and connect it to the large ground stud.

d. Connect a pair of #14, or larger, insulated copper conductors to the nearest 110-120 volt, 60 cycle power supply. It is desirable to use a wall switch or cut out box in this circuit so that power can be disconnected when making changes in wiring or adjustments on the transmitter. These wires should be run through one of the pipe nipples and connected to terminals 16 and 17 of the strip on the transmitter base just inside the rear door.

e. Unpack the tubes carefully and place them firmly in their respective sockets. The sockets are each identified by a "V" number such as V11, V12, etc. The "V" numbers will be found stamped on the chassis near each tube socket. A total of sixteen tubes are used in the Transmitter BC-797-A(B) and one in the Remote Control Unit RM-31-A(B), as follows:

V1 - Type 6J5	V9 - Type 6J5
V2 - Type 6V6	V10- Type 6J5
V3 - Type 6V6	V11- Type 5Z3
V4 - Type 815	V12- Type 5Z3
V5 - Type 829	V13- Type 5Z3
V6 - Type 807	V14- Type 5Z3
V7 - Type 807	V15- Type 5Z3
V8 - Type 6J5	V16- Type VR-75-30

V1R-Type 5Z3

f. Carefully attach the plate caps to the 807, 815 and 829 tubes.

g. Insert a quartz crystal mounted in an FT 164 crystal holder into its clip receptacle on the RF chassis. The fundamental frequency of this crystal should be 1/27 of the desired carrier frequency.

The following examples are listed below:

Operating Frequency		Crystal Frequency
116.1 megacycles	-	4300.00 kilocycles
126.18 megacycles	-	4673.33 kilocycles

14. ANTENNA ASSEMBLY and CONNECTIONS

Refer to the applicable section of Instructions, Airdrome Control Equipment.

15. INSTALLATION REMOTE CONTROL UNIT RM-31-A(B).

This unit is intended to be mounted on a standard 19" relay rack, although it may be installed on a table or shelf. If it is to be mounted on a rack, proceed as follows:

a. Provide space on the rack of at least 7" high, with mounting holes to match the slots in the panel. Put the unit in place, taking care not to chip the wrinkle paint surface. Fasten the panel to the rack using the screws and cupwashers furnished with the rack.

b. Remove the back cover by removing the knurled thumb screws at the rear and pulling the cover back. This will expose all terminals and the tube socket.

c. Place the 523 rectifier tube in its socket, and restore the dust cover.

d. Connect the 110-120 volt, 60 cycle power supply using the 2-pole, male, twist-lock receptacle at the rear of the chassis. If the wire for this purpose is not already in the rack, use a pair of #14 to #18 insulated conductors.

e. Connect one of the telephone pairs to terminals 1 and 2. Connect the other telephone pair to terminals 3 and 4.

f. Connect a #14 insulated copper conductor from the nearest ground to terminal #5.

g. Terminals 6 and 7 are intended to be connected in series with one of the loudspeaker leads of the radio receiver used in conjunction with this equipment.

16. IDENTIFICATION OF TELEPHONE WIRES

It will be necessary now to identify the four telephone wires at the transmitter end. To do this proceed as follows:

a. Make sure that the telephone wires are not connected to anything at the transmitter end.

b. Turn all switches OFF at the Remote Control Unit

c. Supply power to the remote control unit from the main supply, and turn ON the AC Line switch and the Filament switch. DO NOT turn ON the plate switch. Leave the equipment in operation and proceed to the location of the transmitter, BC-797-A(B).

d. At the transmitter, proceed as follows:

1. Open the right front door
2. Locate relay E-3
3. Open rear door and touch each of the four telephone wires in succession to terminal #15 at the rear of the transmitter. The wire that actuates relay E-3 should be connected to terminal #15 permanently. The other wire of the same pair should be connected to terminal #14.
4. Connect the other pair of telephone wires to terminals #12 and #13.

17. CHECK and ADJUSTMENTS PRIOR TO OPERATION

CAUTION: OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE.

Observe safety precautions at all times. Do not change fuses or make adjustments inside the equipment with the high voltage supply ON. Before making adjustments within the transmitter remove power by means of wall switch.

a. Check:- Make a detailed inspection of the equipment as follows:

(1) See that all tubes are firmly seated in their sockets.
(2) See that all grid and plate caps are firmly in place on their respective tubes.
(3) See that all leads are attached. There should be no leads hanging loosely within the cabinet.
(4) Inspect all connections made to the terminal strips to see that there are no loose ends of wire touching adjacent terminals.
(5) Open the left front door of the transmitter housing and see that the line fuses are in place on the lower left chassis.
(6) See that the filament regulator and plate regulator switches on the front panel at the bottom center are in the IN position.

18. PRELIMINARY TUNING ADJUSTMENTS

a. Set Controls as below:

Filament Regulator switch	IN
Plate Regulator switch	IN
A.C. Line switch	OFF
Filament switch	OFF
Plate switch	OFF
Modulation Level control	0
Tune-Operate switch	TUNE
Multi-meter switch	OSC. PLATE
Circuit Breakers:	
Filament	ON
Auxiliary Plate	ON
Main Plate	ON

See that all switches on Remote Control Unit RM-31-A(B) are "OFF".

See that fuses, F1-F2-F3 are in place

Remove Fuse F4. Removes plate and screen voltage to power amplifier tube (V5).

b. Set Tuning Dials as below:

	116.1MC	126.18MC
Osc. Plate	0	0
1st Mult. Plate	7	3½
2nd Mult. Plate	7½	3½
3rd Mult. Grid	0	0
3rd Mult. Plate	6	2½
P. A. Grid	4½	1½
P. A. Plate	6	2½
Coupling	0	0

c. See that the 110-120 volt 60 cycle power source is connected to transmitter and remote control unit.

(1) Operate A.C. Line switch to "ON"
The main line pilot (amber) will light.

(2) Operate Filament switch to "ON".
The filament pilot (green) will light. All tube filaments will be energized, the blowers will operate, and timing motor (TM1) will operate. If all door switches are closed, the bias rectifier will be energized. After approximately 35 seconds the timing motor will operate the time delay switch S10.

(3) Operate the Plate switch to "ON".
Both plate voltage rectifiers will be energized and readings on the plate voltmeters will be approximately as follows:

a. Auxiliary Rect.Plate 255 volts
b. Main Rect. Plate 450 volts

(4) Tune the Osc. Plate dial, increasing the dial reading from zero toward 10. The current as read on the multimeter (switch in "Osc. Plate" position) will decrease gradually and then jump sharply upward. Reset the dial at zero and increase the setting until the plate current has dropped to approximately seven milliampers (read on the 20 MA. scale).

(5) Change the multimeter switch to "1st Mult. Plate". Tune the 1st. Mult. Plate dial to minimum current as read on the multimeter. This dip should be sharp and will appear close to the dial setting shown on the chart. Read current on the 100 MA scale.

(6) Change the multimeter switch to "2nd Mult. Plate". Tune the 2nd Mult. Plate dial to minimum current as read on the multimeter. This dip will not be quite as sharp as the "1st Mult. Plate" but will be distinct. Read current on the 100 MA scale.

(7) Change the multimeter switch to "3rd Mult. Grid". Increase the setting of the 3rd Mult. Grid dial from zero until a maximum of current is obtained on the multimeter. This current should be 3-6 MA (read on 20MA scale).

(8) Change the multimeter switch to "3rd. Mult. Plate". Tune the 3rd. Mult Plate dial to a minimum current as read on the multimeter. This dip will not be very sharp and will occur near the dial setting on the chart. Multiply reading on 20MA scale by 10; 200MA full scale.

(9) Change the multimeter switch to "P.A. Grid". Tune the P. A. Grid dial to read a maximum of current on the multimeter. Read current on 20MA scale.

The setting of this dial and that of the 3rd. Multiplier Plate dial are interdependent and must now be tuned together. Move the 3rd. Mult. Plate dial very slightly in one direction. Re-tune the P. A. Grid dial for maximum current. If the reading obtained is higher than originally, try moving the 3rd Mult. Plate dial slightly further in the same direction and again re-tune the P. A. Grid dial. If the current is less, move the 3rd Mult. Plate dial in the opposite direction and re-tune the P.A. Grid dial. A little practice will soon show the method of obtaining a maximum reading.

(10) The neutralizing adjustments have been properly made at the factory and ordinarily do not require readjustment. However, check to see that the adjusting nuts have not become loose.

In any case the neutralizing can be roughly checked at this time by tuning the P.A. Plate dial through the normal setting as given on the chart. There should be no sharp dip in P. A. Grid current at the normal setting, although the grid current may change somewhat at the zero and maximum setting of the P.A. Plate dial. The proper neutralizing setting is quite broad and will be readily obtained. Adjustment is made by rotating the neutralizing rods on the threaded studs and setting the lock nut to hold the desired position. Raising the rods will increase the capacity to the tube plate circuit components; lowering the rods will decrease it.

(11) Replace fuse F4. Operate the Plate Switch and tune the P. A. Plate dial to minimum plate current as read on the Power Amp. Plate meter.

(12) Increase the setting of the Coupling dial from zero until the P. A. Plate current is approximately 100MA. Re-tune the P. A. Plate dial to minimum current. Readjust the coupling dial to 100 MA plate current at resonance.

(13) Change the Tune-Operate switch from "Tune" to "Operate." Increase the Coupling dial until the P. A. Plate current is approximately 150MA. Retune the P. A. Plate dial to

minimum current. Readjust the Coupling dial until the P. A. Plate current is 180MA. This is the proper operating condition.

NOTE: When the Tune-Operate Switch is in the "Operate" position the P. A. plate current should never exceed 200MA for more than a few seconds or the type 829 tube may be permanently damaged.

d. Adjustment of Modulation Level Control.

Two procedures are given for properly adjusting the Modulation Level controls on the transmitter and remote control unit. The first method is to be preferred if an audio oscillator is available.

Method 1.

During this procedure, switches, AC Line, Filament and Plate should be in the OFF positions.

Connect the output terminals of an audio oscillator adjusted for 1000 cycles across terminals 1 and 2 on the Remote Control Unit RM-31-A(B). The audio voltage necessary is less than 2 volts and care should be taken not to exceed this value when the audio oscillator is first turned on or the Audio Line Level meter on the Remote Control Unit may be damaged. If necessary connect resistances in each lead from the audio oscillator to cut the voltage sufficiently.

Set the Modulation Level control on the Remote Control Unit RM-31-A(B) to maximum (10). Increase the output of the audio oscillator until the Audio Line Level meter reads 100%.

Now operate the Radio Transmitter BC-797-A(B) by means of the switches on the transmitter itself. Check for proper adjustment of all tuning circuits and see that the Tune-Operate switch is in the Operate position.

Increase the setting of the Modulation Level control on the transmitter from zero until the Modulation Level meter reads 100%. This should occur between 2 and 4 on the Modulation Level control dial scale. Record this setting and do not again change it.

Shut off the Filament and Plate switches on the transmitter but leave the AC Line switch "ON". This will leave the transmitter set up for remote operation.

Remove the connections to the audio oscillator, and the equipment is ready for use.

Insert the microphone plug in the Microphone Jack on the Remote Control Unit RM-31-A(B), and operate the AC Line switch. The amber pilot will light.

Operate the Filament switch on the remote control unit. The green pilot will light and the transmitter filament circuits (green pilot on transmitter) will be energized.

After allowing 35 seconds for the time delay action in the transmitter, operate the Press to Talk switch on the microphone stand handle. The red pilot will light and the transmitter plate circuits (red pilot on transmitter) will be energized.

Talk into the microphone. The Modulation Level meter will respond, the transmitter will be modulated, and the Modulation Level meter on the transmitter will operate in synchronizm with the meter on the remote control unit.

Talk into the microphone only oud enough to make the Modulation Level meter average 50%. Because of the wave shape characteristics of speech a 50% average level will actually produce approximately 100% modulation on peaks. If the average modulation level is held at or close to the 100% mark with speech transmission the transmitter will be badly overmodulated.

The Plate switch on the remote control unit is effectively in parallel with the microphone switch and its operation will energize the red pilot and turn on the transmitter carrier, provided 35 seconds have elapsed after the Filament switch is operated. It is useful for test purposes, but in normal operation the Plate switch should be left in the OFF position and the transmitter output controlled by means of the Press to Talk switch on the microphone handle.

Method 2.

If an audio oscillator is not available, a less accurate but satisfactory adjustment of the Modulation Level control on the transmitter may be performed as follows:

Operate the transmitter by using control switches on the transmitter itself. Check for proper adjustment of tuned circuits, see that the Tune-Operate switch is in the Operate position, and set the transmitter Modulation Level control at zero. Turn OFF Plate and Filament switches on the transmitter but leave the AC Line switch in the ON position.

At the Remote Control Unit, insert the microphone plug in the Microphone Jack and operate the AC Line switch. The amber pilot will light.

After allowing 35 seconds for the time delay action in the transmitter, operate the Press to Talk switch on the microphone stand handle. The red pilot will light and the transmitter plate circuits will be energized.

Talk into the microphone and increase the setting of the Modulation Level control on the remote control unit until the reading on the Modulation Level meter averages 50%.

Have an operator read in a steady tone of voice into the microphone at the average 50% level, and have another operator increase the setting of the Modulation Level control on the transmitter until the Modulation Level meter there also averages 50%.

Shut down all equipment. The system is now ready for service.

19. OPERATION

After the transmitter has been properly tuned and adjustment of the Modulation Level controls effected, it is normally operated in the following manner:

a. See that the AC power source is connected to transmitter and remote control unit.

b. Operate AC Line switches on transmitter and remote control units (amber pilots will light) to ON.

c. Operate Filament switch on remote control unit (green pilots on both transmitter and remote control unit will light) to ON. This condition represents the normal "Stand-by" position.

d. With microphone plug in place in the Microphone Jack on the remote control unit, operate the Press to Talk switch on the microphone stand handle. If the Filament circuit has been energized for at least 35 seconds to allow for the time delay function in the transmitter, the plate power will be applied and carrier power will be supplied to the antenna system. (The red pilots on both transmitter and remote control unit will light.)

e. Talk into the microphone just loud enough to cause the Modulation Level meter on the remote control unit to average a reading of 50%. Do not swing the meter to 100% as this will represent serious overmodulation with speech input.

f. Release the Press to Talk switch on the microphone handle. The red pilots will be extinguished and the transmitter is in "Stand-by" position.

g. If the transmitter is not to be used for an extended period of time, operate the Filament and AC Line switches on

the remote control unit to OFF. Remember, however, that 35 seconds are required for the transmitter to become operative after the Filament switch is again turned ON.

h. Always leave the AC Line switch on the transmitter in the ON position. If this switch is OFF the transmitter can not be controlled from the remote control position.

i. The transmitter can also be operated by means of the switches on the transmitter proper. If this method is desired, proceed as follows:

1. Place microphone plug in the Microphone Jack on the transmitter.
2. Operate Filament switch to ON.
3. Wait 35 seconds for time delay and Operate Press to Talk switch on microphone handle. The red pilot will light.
4. Talk into the microphone just loud enough to average 50% on the Modulation Level meter.
5. Do not change the setting of the Modulation Level control on the transmitter or proper operation will no longer be obtained at the remote control position.

20. PRECAUTIONS DURING OPERATION

When the transmitter is modulated by means of a microphone plugged into the Microphone Jack on the transmitter, audio voltage proportional to the loudness of the speech is fed back on the telephone line to the remote control unit and is indicated on the Modulation Level meter on the remote control unit. This will take place regardless of whether the remote control unit switches are on or off.

If the setting of the Modulation Level control on the transmitter has not been disturbed, the meters on transmitter and remote control unit will read alike. However, if the setting of the control on the transmitter is reduced toward zero, the reading on the remote control meter will be increased with respect to the reading of the transmitter meter. If this is carried to an extreme, it is possible to permanently damage the meter on the remote control unit.

If it is intended to operate permanently from the transmitter proper, it is desirable to disconnect the telephone wires from the remote control unit. These wires are connected to terminals 12 through 15 on the terminal strip at the rear of the transmitter. Tag each wire so that they may be readily reconnected.

III. THEORY OF OPERATION.

21. GENERAL.

The Radio Transmitter BC-797-A(B) is a crystal controlled telephone transmitter capable of delivering approximately 50 watts of modulated radiofrequency energy to a suitable transmission line and antenna system. In conjunction with a Remote Control Unit RM-31-A(B) the transmitter may be remotely controlled over two pair of telephone lines up to a wire line distance of 2½ miles.

The theoretical description of circuits is divided into the following groups:

a.	Radio Frequency Circuits	(Paragraph 22)
b.	Audio Frequency Circuits	(" 23)
c.	Power Supplies	(" 24)
d.	Metering Circuits	(" 25)
e.	Control Circuits	(" 26)
f.	Protective Circuits	(" 27)
g.	Remote Control Unit Circuits	(" 28)

22. RADIO FREQUENCY CIRCUITS.

The radio frequency portion of the transmitter comprises a triode crystal oscillator, three pentode triplers, a pentode class C power amplifier, and a transmission line coupling system.

The crystal oscillator consists of a triode vacuum tube V1(6J5), and its associated components. The crystal frequency is 1/27 of the desired carrier output frequency. As the nominal range of the transmitter is 116 to 126.25 megacycles, the crystal frequency will be between 4296 and 4676 kilocycles.

The plate circuit of the crystal oscillator is tuned by tank circuit L1-C2 and is capacity coupled to the grid of the 1st Multiplier V2 (6V6). This tube acts as a tripler and is tuned by tank circuit L2-C5 which is resonated to a frequency 3 times the crystal frequency.

The output of the 1st Multiplier is capacity coupled to the grid of the 2nd Multiplier V3 (6V6) which is tuned by L3-C8, resonant at 9 times the crystal frequency. This circuit is inductively coupled to L4-C10, resonant at the same frequency, which applies excitation voltage to the grids of the 3rd Multiplier V4(815). This tube acts as a push-pull tripler.

The output of V4, tuned by L5-C14 to 27 times the crystal frequency is inductively coupled to the power amplifier grid inductance L6. This circuit is resonant at the same frequency and is tuned by C13.

The power amplifier is a fundamental class C amplifier comprising push-pull pentode V5(829). The plate circuit is tuned by L7-C16 to 27 times the crystal frequency. This tube is plate and screen modulated.

The variable coupling inductance L8 serves to draw power from the power amplifier tank circuit and through the impedance adjusting circuit L9 transfer this power to the antenna transmission line.

23. AUDIO FREQUENCY CIRCUITS.

The audio system comprises a triode speech amplifier - phase inverter, two triode drivers and two pentode class AB2 modulators.

The input transformer T6 has two primaries, one for a 600 ohm telephone line and the other for a 30 ohm carbon microphone. The voltage output of this transformer is controlled by Modulation Level control R18.

The speech amplifier V10(6J5) is used as a voltage amplifier and phase inverter. The excitation voltage for driver tube V8(6J5) is taken from the plate circuit through C23 and for driver tube V9(6J5) from the cathode circuit through C24. The plate and cathode audio voltages are 180 degrees out of phase, thus providing the proper voltages for push-pull operation.

The driver stage is coupled through transformer T7 to the grids of the push-pull modulator V6, V7, (2-807). The output of the modulator is coupled to the radio frequency power amplifier through modulation transformer T8. RFC1 and RFC2 are used to prevent the generation of spurious frequencies.

24. POWER SUPPLIES.

There are three power supplies; bias rectifier, auxiliary plate rectifier, and main plate rectifier.

The bias supply uses tube V15 (5Z3) in a full wave circuit filtered by X1-C28. The full output (approximately 55 volts) of this rectifier is used to supply fixed bias voltage

to all RF stages except crystal oscillator and voltage for operation of relay E2. Through dropping resistor R24, filtered by C27, voltage is supplied to the carbon microphone when it is inserted in Microphone Jack (J1). Voltage is also supplied from this point to operate relay E4 (through contacts on relay E5 and R26).

Fixed bias voltage is applied to the grids of the modulators (V7, V8) from the junction of bleeder resistors R22-R23, filtered by C20. From this same point, voltage is obtained to operate relay E5 through R35.

Bias voltages for the radio frequency stages are stabilized by means of regulator tube V16 (VR-75-30), the action being as follows:

When the crystal stage is not oscillating the full voltage of the bias rectifier (approximately 55 volts) is applied as a fixed bias to the grids of all RF amplifier stages through equalizing resistor R25 and the individual grid resistors R3, R4, R5, R8, R9. This voltage prevents damage to the tubes when there is no excitation.

When the crystal stage is oscillating grid current flows in V2 and succeeding stages as the tuned circuits are resonated. This current flows through R25 and when the voltage developed at the regulator tube reaches approximately 75 volts to ground the tube is ignited and tends to maintain the voltage constant at a value of 75 volts.

The auxiliary plate rectifier develops approximately 250 volts, uses V14(5Z3) in a full wave circuit, filtered by X2-C29. This rectifier supplies all plate and screen voltages for the crystal oscillator, 1st and 2nd multipliers, speech amplifier, and audio driver tubes.

The main plate rectifier supplies approximately 450 volts from a full wave circuit using three tubes in parallel (V11, V12, V13, 3-5Z3). The filter comprises X3-C30. The full output is applied to plate and screen circuits of the 3rd multiplier, power amplifier and plates of modulator tubes. The modulator screen voltage is obtained from the junction of the bleeder resistors R19-R20.

25. METERING CIRCUITS.

Six meters are provided as follows on the transmitter:

M1 - Multimeter
M2 - P. A. Plate Current
M3 - Modulation Level
M4 - Modulator Plate Current
M5 - Main Rectifier Voltage
M6 - Auxiliary Rectifier Voltage

The multimeter is used to measure the current flowing in eight separate circuits, switching is accomplished by means of S6. Fundamentally, the meter is a voltmeter which measures the voltage drop across small resistors connected in series with the circuit where measurements are desired. Calibration, however, is directly in milliamperes.

The meter requires 1 MA to produce full scale deflection and has an internal resistance of 5000 ohms. There are three ranges used in this application 0-20 MA, 0-100 MA, and 0-200 MA full scale. The meter itself has the first two scales and the third is obtained by multiplying the 0-20V. scale by 10.

The proper scale for each switch position is as follows:

Circuit	Scale Used	Meter Shunt
Osc. Plate	20 MA	(R27)
1st Mult. Plate	100 MA	(R28)
2nd Mult. Plate	100 MA	(R29)
3rd Mult. Grid	20 MA	(R30)
3rd Mult. Plate	200 MA	(R31)
P. A. Grid	20 MA	(R32)
Audio Amp.	20 MA	(R34)
Driver Amp.	100 MA	(R33)

The meters M2 and M4 are standard milliameters used to measure the direct current flowing in their respective circuits.

The voltmeters M5 and M6 serve to measure the output of the plate rectifiers.

The Modulation Level meter M3 is fundamentally a rectifier type AC milliameter used with external multiplier R36. The meter is calibrated in approximate percentage modulation and is accurate when the modulation is sinusoidal. It measures the audio voltage applied to the class C power amplifier plate circuit. The theory of operation depends upon the fact that when the peak audio voltage applied to class C amplifier is equal to the value of the applied DC plate voltage, 100% modulation is obtained.

26. CONTROL CIRCUITS.

a. The control circuits are arranged for local or remote operation of the transmitter. AC Line switch S1 applies power through fuses F1 and F2, lights the amber pilot P1, and readies the transmitter for either local or remote operation.

b. Local Operation.

When the Filament switch S2 is operated, AC voltage is applied to contactor E1. Power is then applied through the contacts of E1, the filament voltage regulator VR1 and, the filament circuit breaker CB1, to filament transformers T1 and T4, green pilot P2 and timing motor TM1. Power is also supplied to bias rectifier transformer T2, providing the door switches S8, S9, S11 are closed. The relay contacts (E1) also apply power to the ventilating blowers B1, B2.

After the filament circuit has been energized for approximately 35 seconds, the timing motor TM1 will operate time delay switch S10 which is in series with the contacts of the plate contactor E2.

When the Plate switch S3 is closed and the bias supply is operating, voltage is supplied from the bias rectifier through R35 to operate the Press to Talk relay E5. The contacts of this relay apply voltage through R26, operating plate control relay E4. The contacts of this relay apply voltage from the bias supply to operate the plate contactor E2.

When E2 is closed AC power is supplied through the plate voltage regulator VR2 to the red pilot P3 and then through circuit breakers CB2 and CB3 to plate transformers T3 and T5.

So called "four way type" switches S4 and S5 serve to cut the voltage regulators VR1 and VR2 in or out as desired. The regulators are intended for use on 60 cycle supply frequency only. If the power source is other than 60 cycles the regulators should be cut out of the circuit.

The Press to Talk switch on the microphone handle applies voltage to the microphone and closes a circuit in parallel with Plate switch S3 to perform the same functions as the Plate switch.

c. Remote Control.

When voltage is applied across terminal 15 and ground the filament control relay E3 will be operated. The contacts of E3 are in parallel with the Filament switch S2 and the same functions take place as if S2 were closed.

When voltage is applied across terminal 14 and ground the plate control relay E4 will be operated and the same functions will take place as if E4 were operated by the Press to Talk relay E5 as described above.

27. PROTECTIVE CIRCUITS

The Tune-Operate switch S7, when in the Tune position serves to cut resistors into the plate and screen circuits of the 3rd multiplier and power amplifier tubes to protect them against overload during tuning procedures.

Line fuses F1 and F2 protect the power circuits as a whole. Fuse F3 is in series with the 3rd multiplier plate and screen circuit and fuse F4 is in the power amplifier plate and screen circuit.

Circuit breaker CB1 protects the filament circuits. CB2 is in the auxiliary rectifier primary circuit and CB3 is in the primary circuit of the main rectifier.

28. REMOTE CONTROL UNIT RM-31-A(B) CIRCUIT.

The AC power is supplied through the twist-lock receptacle, line fuse F1R and AC Line switch S3R, to the power transformer T1R.

The full wave rectifier V1R (5Z3) filtered by X1R-C1R supplies power for the microphone, operation of the Press to Talk relay E1R, and control of the transmitter over the telephone lines.

The Filament switch S2R applies voltage through the green pilot P2R to terminal 3 which through the telephone wire connected to terminal 15 at the transmitter serves to operate filament control relay E3.

The Plate switch S1R applies voltage through the red pilot P3R to terminal 4 which through the telephone wire connected to terminal 14 at the transmitter serves to operate transmitter plate control relay E4.

Operation of the Press to Talk switch on the microphone applies voltage to the microphone through the primary of transformer T2R and also serves to operate relay E1R.

One pair of contacts on E1R is in parallel with the Plate switch S1R and performs the same function. The other pair of contacts serves to open an external circuit connected to terminals 6 and 7. In practice, these terminals are connected in series with a loud speaker and thereby silences the loud speaker preventing acoustic feed-back during voice transmissions.

A Modulation Level meter (M1R) is connected across the telephone pair used as the audio line (Terminals 1 and 2). The meter (M1R) is the same type as M3 in the transmitter. It is used as a voltmeter in conjunction with multiplier resistor R3R to indicate the average audio voltage being applied to the audio line.

IV. SERVICING & REPAIR

29. SERVICING.

Systematic checking of the operation of parts and the readings of meters will often prevent the failure of the transmitter. Some of the steps that can be taken to avoid failure are listed below:

a. Replace burnt out pilot lights.

b. Check the time taken for the time delay switch to close. If it is slow, replace.

c. Replace switch if there is any indication of excessive heating at the switch or if there is evidence of poor contact in the switch.

d. Clean or replace relays if they exhibit any tendency to be sticky in operation.

e. Replace modulation level control if it exhibits any tendency to be discontinuous or "jumpy" during modulation level adjustments.

f. Replace meter switch as soon as it begins to show evidence of a poor contact.

g. Lubricate condenser bearings if any tuning adjustment exhibits unusual friction.

h. Replace any tube that indicates an operating current 20% less than the current indicated when first installed.

i. If auxiliary or main rectifier voltmeters indicate 10% less voltage than when first installed, replace rectifier tubes.

j. Keep gas pressure on antenna transmission line. Check for moisture.

k. Do not permit transmitter to continue to operate if there is the least indication of sparking, arcing, corona discharge or tube flashing.

l. Do not permit transmitter to continue to operate if there is any unusual noise or vibration in the transmitter.

m. Make an occasional inspection to determine the presence of insects, mice, etc. Clean out if necessary.

n. Do not permit the transmitter to continue to operate if there is the least evidence of overheating as evidenced by smoke or smell.

o. If the antenna is obviously grounded, do not transmit.

p. Do not keep the plate switch closed, putting carrier on the air when not required.

30. TABLE OF OPERATING VOLTAGES.

Measurements made on indicated scale of 1000 ohms per volt DC test meter with transmitter operating normally.

Circuit	Positive Prod.	Negative Prod.	Reading	Scale
V1	Cathode	Gnd	6.5	20V
V1	Rotor C2	Gnd	190	500V
V2	Rotor C5	Gnd	250	500V
V3	Rotor C8	Gnd	250	500V
V4	Cathode	Gnd	65	100V
V4	Screen	Gnd	250	500V
V4	Center L5	Gnd	440	500V
V5	Screen	Gnd	215	500V
V5	Center L7	Gnd	420	500V
V6-V7	Screen	Gnd	300	500V
V6	Plate	Gnd	440	500V
V7	Plate	Gnd	440	500V
V8-V9	Cathode	Gnd	8	20V
V8	Plate	Gnd	250	500V
V9	Plate	Gnd	250	500V
V10	Plate	Gnd	210	500V
V10	Cathode	Gnd	9.5	20V
V16	Pin #2	Gnd	70	100V
C20	Gnd	Pin #1	34	100V
C28	Gnd	Pin #1	64	100V
C27	Gnd	Pin #1	4 or 20	20V
C1R	Gnd	Pin #1	20	100V
C2R	Gnd	Pin #1	2 or 14	20V

31. METER READINGS - LIMITS

Osc. Plate	- Crystal not oscillating	- 7-9 MA
Osc. Plate	- Properly tuned	- 7 MA
1st Mult. Plate	- Properly tuned	- 25-35 MA
2nd Mult. Plate	- Properly tuned	- 35-50 MA
3rd Mult. Grid	- Properly tuned	- 3-6 MA
3rd Mult. Plate	- Properly tuned	- 100-135MA
Power Amp. Grid	- Properly tuned	- 8-15 MA
Power Amp. Plate	- Properly tuned	- 170-180MA
Audio Amp. Plate	-	- 2-3 MA
Audio Driver Plate	-	- 15-20 MA
Modulator Plate	- No modulation	- 45-90 MA
Modulator Plate	- Modulated	- 200 MA Max.
Modulation	- Modulated	- Average 50%
Aux. Rect. Voltage	-	- 240-270 Volts
Main. Rect Voltage	-	- 425-460 Volts

32. TROUBLE LOCATION CHARTS

a. General

Symptom	Possible Cause	Correction
1. Amber pilot does not light when S-1 is operated	115 volt 60 cycle supply not connected.	Connect 115V-60 Cycle supply
	Lamp burnt out	Replace lamp.
	Fuse F1 or F2 or both burnt out.	Determine cause of fuse burnout and correct. Replace fuses.
	Defective switch S-1	Replace switch
2. Green pilot does not light when local filament switch S-2 is operated.	Defective switch, S-2	Replace switch, S-2
	Defective filament contactor, E-1	Replace filament contactor, E-1
	Defective voltage regulator switch, S-4	Replace voltage regulator switch, S-4.
	Defective voltage regulator, VR-1	Operate voltage regulator switch, S-4 to "Out" position Operate without voltage regulator, VR-1. Replace voltage regulator, VR-1 with matched condensers.
	Filament circuit breaker CB-1 not closed	Close.
	Filament circuit breaker CB-1 defective	Replace.
3. Blower does not start when switch S-1 is operated	115 v. 60 cycle supply not connected	Connect 115 v. 60 cycle supply
	Fuse F1 or F2 or both burnt out.	Determine cause. Repair. Replace fuses.
	Defective blower	Replace blower
	Defective switch, S-1	Replace switch, S-1

(continued on page 28)

Symptom	Possible Cause	Correction
4. Green pilot does not light when remote control line is actuated.	Trouble at remote control unit.	Refer to directions for remote control unit.
	Filament relay E-3 defective.	Replace
	See section 3 in this tabulation.	See Par. 32-a-3
5. Red pilot does not light when local plate switch S-3 is op-operated.	Defective lamp.	Replace.
	Time delay motor defective	Replace.
	Time delay switch, S-10 defective	Replace
	Local press to talk relay, E-5 defective.	Replace
	Remote Plate contactor relay, E-4 defective	Replace
	Place contactor, E-2, defective	Replace
	Resistor, R-35 open or grounded	Replace or repair
	Trouble in bias supply	Refer to Par. 32-b.
	Door switch, S-8, S-9, S-11 not closed or defective	Adjust or replace
6. Red pilot does not light when remote control unit is actuated.	Trouble at remote control unit.	Refer to directions for remote control unit Par. 32-f
	See Par. 32-a-5.	See Par. 32-a-5
7. Voltmeter M-7 does not indicate when auxiliary circuit breaker, CB-2 is closed and red pilot is lit.	Defect in auxiliary rectifier	Refer to Par. 32-c.
	Capacitor, C-25, shorted	Replace
	Meter M-6 defective	Replace
	Transformer T-7 grounded	Replace
	Meter switch S-6 grounded	Repair
8. Voltmeter, M-5 does not indicate	Defect in main supply rectifier	See Par 32-d.
	Capacitor C-19 shorted.	Replace
	Meter, M-5 defective	Replace

(continued on page 29)

Symptom	Possible Cause	Correction
8. continued.	Transformer T-8 grounded	Replace
	RFC-1 or RFC-2 grounded	Replace
	VT-7 or VT-8 defective	Replace
9. P. A. plate milliammeter, M2 does not indicate	Defect in main supply rectifier	See Par. 32-d
	Capacitor C-17 shorted	Replace
	VT-5(#829) defective.	Replace
	Resistor R-10 grounded	Determine cause and repair
	Capacitor, C-15 grounded or shorted	Replace
	Tune-Operate switch, S-7 defective.	Replace
	Fuse F-4 open	Determine cause, Repair defect. Replace fuse.
10. Modulator plate milliammeter M-4 does not indicate	Capacitor C-21 shorted	Replace
	Meter M-4 defective	Replace
	V-6 or V-7 defective	Replace
	RFC-1 and RFC-2 open	Replace
	T-8 open or shorted	Replace
	No voltage on screens of V-6 and V-7	See Par. 32-d.
	No voltage on plates of V-6 and V-7	See Par. 32-d.
11. Modulation meter M-3 does not indicate when using microphone	Modulation level control, R-18 not properly adjusted.	Adjust as directed in Par. 18-d.
	Condenser, C-18 open	Replace
	Resistor R-36 open	Replace
	Meter, M-3 defective	Replace
	Fuse, F-4 open	Determine cause. Repair. Replace fuse F-4.
	Defect in audio amplifier	Determine cause as directed in Par. 32-e. Repair.

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Symptom	Possible Cause	Correction
11. continued.	Microphone press to talk switch defective	Replace.
	Main and/or Auxiliary plate supplies do not deliver voltage	Refer to Par. 32-c and Par. 32-d.

b. Bias Supply

Symptom	Possible Cause	Correction
1. No voltage from ground to negative terminal of capacitor, C-28	Door switches, S-9, S-8, and S-11, not operated	Close cabinet door.
	Defective door switch.	Replace.
	Defective bias transformer, T-2	Replace.
	Defective rectifier tube, 5Z3	Replace.
	Defective reactor, X-1	Replace.
	Defective capacitor, C-28	Replace.
	Short from ground to output terminal of reactor, X-1	Determine cause and repair.
2. No voltage from ground to junction of R-22 and R-23	Resistor R-22 open.	Replace.
	Resistor R-23 shorted.	Determine cause and correct.
	Capacitor C-20 shorted.	Replace.
	Secondary of T-7 grounded.	Replace T-7.

c. Auxiliary Rectifier

Symptom	Possible Cause	Correction
1. No voltage across terminals of capacitor, C-29	Auxiliary circuit breaker, CB-2 open	Close.
	Defective transformer, T-3	Replace.
	Defective rectifier tube, 5Z3	Replace.
	Defective transformer, T-2	Replace.
	Open reactor, X-2	Replace.
	Grounded reactor, X-2	Determine cause and repair. or replace.
	Short across R-21	Determine cause and repair.

1.	No voltage across terminals of C-30.	Main supply circuit breaker, CB-3 open	Close.
		Transformer T-5 defective.	Replace.
		Transformer T-4 defective.	Replace.
		Defective rectifier tubes, V11, V12 or V13.	Replace
		Reactor X-3 grounded or open.	Replace.
		Capacitor C-30 shorted.	Replace.
		Resistor R-19 grounded.	Determine cause and correct.
2.	No voltage across resistor, R-20	R-20 shorted.	Determine cause and correct.
		Defective V-6 or V-7	Replace
		Resistor, R-19 open	Replace.

e. Audio Amplifier (Microphone in Use)

	Symptom	Possible Cause	Correction
1.	No audio voltage on secondary of T-6	Defective microphone.	Replace.
		Defective microphone switch.	Replace.
		Defective microphone plug.	Replace.
		Defective microphone jack.	Replace.
		Shorted or open primary or secondary of T-6	Determine cause. Correct or replace T-6
2.	No audio voltage between ground and grid of V-10 (6J5). Modulation Level control, R-18 at maximum	Defective level control, R-18.	Replace.
3.	No audio voltage between ground and plate of V-10 (6J5).	Defective tube.	Replace.
		Plate circuit of V-10 open or shorted or grounded.	Determine cause and correct

(continued on page 33)

Symptom	Possible Cause	Correction
3. (continued)	Cathode resistor, R-17 and/or R-34 open.	Replace.
	No plate voltage supply.	Refer to section c of this tabulation.
4. No audio voltage between ground and cathode of V-10 (6J5).	Same as C above.	Same as C. above.
	Cathode resistor, R-17, grounded or shorted.	Determine cause. Repair or replace.
5. No audio voltage between ground and grids of V-8 (6J5) or V-9 (6J5).	C-23 or C-24 open.	Replace.
	R-14 or R-15 shorted or grounded	Determine cause. Repair or replace.
6. No audio voltage between ground and plate of V-8 (6J5) or V-9 (6J5).	Plates do not receive DC voltage.	Refer to section c of this tabulation.
	Primary winding T-7 grounded or open.	Replace.
	Cathode resistor, R-13, open	Replace.
	Defective tubes V-8 (6J5) and V-9 (6J5).	Replace.
	Shorted secondary winding of T-7.	Replace.
	Capacitor C-22 shorted.	Replace.
	Shorted grid of V-6 (807) or V-7 (807)	Replace.
7. No audio voltage between ground and control grid of V-6 (807) or V-7 (807)	See section e-6.	See section e-6

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Symptom	Possible Cause	Correction.
8. No audio voltage between ground and plates of V-6 or V-7 (807)	Main plate supply not delivering voltage to plates of 807 tubes	Refer to section d
	Auxiliary plate supply rectifier not delivering voltage to screens of V-6 (807) and V-7 (807)	Refer to section c
	Grids of V-6 (807 and V-7 (807) not receiving bias voltage	Refer to section b
	Capacitor, C-22, shorted or open	Replace.
	Primary of transformer T-8 shorted or open or grounded	Replace
	Suppressors RF C-1 and/or RF C-2 shorted or open	Replace.
	Secondary of transformer T-8 shorted or grounded.	Remove ground or replace shorted transformer
	Tune-Operate switch defective	Replace.

f. Remote Control Unit, RM-31-A(B)

Symptom	Possible Cause	Correction
1. Line pilot, P1R, does not light, when Line switch, S3R is operated.	AC connector plug not inserted. into twist lock receptacle.	Insert properly.
	Defective switch.	Replace.
	Fuse, F1R, burnt out	Determine cause, correct and replace.
	Defective transformer, T1R,	Replace.
	Defective lamp.	Replace.
2. No DC. voltage between terminals #5 and #3 when Filament switch, S2R, is operated.	Defective Filament pilot lamp, P2R.	Replace.
	Defective switch, S2R (FIL)	Replace.
	No DC voltage from rectifier	Determine cause and repair.
3. No DC voltage between terminals #5 and #4 when Plate switch, S1R is operated	Defective pilot lamp, P3R(Plate)	Replace.
	Defective switch, S1R (PL.)	Replace.
4. No DC voltage between terminals #5 and #4 when microphone press to talk switch is operated and switch, S1R (PL.) is open.	Defective microphone switch.	Replace.
	Defective relay E1R.	Replace.
	Defective microphone plug or jack.	Replace.
5. No deflection of meter M1R, when microphone is used.	Defective microphone.	Replace.
	Defective microphone plug or jack.	Replace.
	No DC voltage out of rectifier.	Determine cause and repair.
	Transformer, T2R, defective	Replace.
	Meter M1R defective	Replace.
	Condenser, C3R, open	Replace.
	Resistor, R3R, open	Replace.
	Telephone wires connected to terminals #1 and #2 shorted.	Determine cause and correct.

33. PARTS LIST BC-797-A(B)

Symbol	Name or Function	Description	Mfr.	Ident.
B1	Ventilating Blower	40 Cu.Ft. per min., 30 watts	F.A.Smith	50740-2C
B2	Ventilating Blower	40 Cu.Ft. per min, 30 watts	F.A.Smith	50740-1C
C1	Osc. Cathode Bypass	.005 mfd. mica -20%+100%,750 V. DC. Test.	Solar	MWBW-1239
C2	Osc. Tuning	8-26 mfd. air, single section variable	Johnson	25-H-30
C3	Osc. Plate Bypass	.005 mfd. mica,-20%+100%,750 V. DC. Test	Solar	MWBW-1239
C4	1st. Mult. Grid	.001 mfd. mica,-20%+100%, 1000 V. DC. Test	Solar	MWBW-1227
C5	1st. Mult. Tuning	8-26 mfd. air, single section variable	Johnson	25-H-30
C6	1st. Mult. Plate Bypass	.005 mfd. mica -20%+100%, 750 V. DC. Test.	Solar	MWBW-1239
C7	2nd. Mult. Grid.	.001 mfd. mica,-20%+100%, 1000 V. DC. Test	Solar	MWBW-1227
C8	2nd. Mult. Tuning	8-26 mfd. air, single section variable	Johnson	25-H-30
C9	2nd. Mult. Plate Bypass	.005 mfd. mica,-20%+100%,750 V. DC. Test	Solar	MWBW-1239

Symbol	Name or Function	Description	Mfr.	Ident.
C10	3rd. Mult. Grid Tuning	25 mfd. per section, air, dual section	Johnson	RRCo drawing B-166-145 Item 2
C11	3rd. Mult. Cathode Bypass	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C12	3rd. Mult. Screen Bypass	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C13	P. A. Grid Tuning	25 mfd. per section, air, dual section	Johnson	RRCo drawing B-166-145 Item 1
C14	3rd. Mult Plate Tuning	25 mfd. per section, air, dual section	Johnson	RRCo drawing B-166-145 Item 2
C15	P. A. Screen Bypass	.0005 mfd. mica -20%+100%, 2000V. DC. Test	Solar	MHBW-1022
C16	P. A. Plate Tuning	25 mfd. per section, air, dual section	Johnson	RRCo drawing B-166-145 Item 2
C17	Meter Bypass	.005 mfd. mica, -20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C18	Mod. Level Meter Blocking	.1 mfd. paper,-20%+100%, 1000 V. DC. W.	Solar	XDRMW 10-.1
C19	Meter Bypass	.0005 mfd. mica,-20%+100%, 2000V. DC. Test	Solar	MHBW-1022
C20	Mod. Bias Bypass	200 mfd., Plug in electrolytic, 50 V. DC. W.	Solar	

Symbol	Name or Function	Description	Mfr.	Ident.
C21	Meter Bypass	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C22	Mod. Grid	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C23	Audio Driver Grid	.05 mfd. paper,-20%+100%, 400V. DC. W.	Solar	XDRMW-4-.05
C24	Audio Driver Grid	.05 mfd. paper,-20%+100%, 400V. DC. W.	Solar	XDRMW-4-.05
C25	Meter Bypass	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C26	Meter Bypass	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239
C27	Micro. Filter	200 mfd. Plug in electrolytic 50 V. DC. W.	Solar	
C28	Bias Filter	50 mfd., Plug in electrolytic, 100V. DC. W.	Solar	
C29	Aux. Supply Filter	20 mfd., oil paper,-20%+100%, 600V. DC. W.	Solar	XLMUW
C30	Main Supply Filter	20 mfd. oil paper,-20%+100%, 600V. DC. W.	Solar	XLMUW
C31	Audio Amp. Plate Bypass	1 mfd. paper,-20%+100%,400V. DC.W.	Solar	XDRHW-4-1
C32	2nd Mult. Screen Bypass	.005 mfd. mica,-20%+100%, 750 V. DC. Test	Solar	MWBW-1239

Symbol	Name or Function	Description	Mfr.	Ident.
CB1	Fil. Circuit Breaker	2.0 amps	Heinemann	0411
CB2	Aus. Supply Breaker	0.6 amps	Heinemann	0411
CB3	Main Supply Breaker	4 amp- Cat. No. 0411 Issue J-532	Heinemann	0411
E1	Fil. Contactor	115 Volt 60 cycle coil, Double make	W.L.	106-6124
E2	Plate Contactor	1 Form A microswitch, 6500 ohm DC coil	Clare	A-11357
E3	Fil. Control Relay	50 ohms, 0.8 v. DC. coil,S.P.D.T.	Allied	BD-30
E4	Plate Control Relay	50 ohms, 0.8 v. DC. coil,S.P.D.T.	Allied	BD-30
E5	Press to Talk Relay	12,000 ohms, 12v. DC.coil,S.P.D.T.	Allied	BD-42
F1	Line Fuse	10 amp, 250v.std. renewable cartridge	Jefferson	
F2	Line Fuse	10 amp, 250v. std. renewable cartridge	Jerrerson	
F3	3rd. Mult Plate Fuse	3/8 amp. 500 volt	Bussman	3AG
F4	P. A. Plate Fuse	3/8 amp. 500 volt.	Bussman	3AG
J1	Micro. Jack	Telephone type Jack	W.E. Co.	246-E

Symbol	Name or Function	Description	Mfr.	Ident.
L1	Osc. Plate	Spec. 453-L1	RRCo.	
L2	1st. Mult Plate	Spec. 453-L2	RRCo.	
L3	2nd. Mult. Plate	Spec. 453-L3	RRCo.	
L4	3rd. Mult. Grid	Spec. 453-L3	RRCo.	
L5	3rd. Mult. Plate	Spec. 453-L5	RRCo.	
L6	P. A. Grid	Spec. 453-L6	RRCo.	
L7	P. A. Plate	Spec. 453-L7	RRCo.	
L8	Output Coupling	Spec. 453-L8	RRCo.	
L9	Transmission Line Coupling	Spec. 453-L9	RRCo.	
M1	Multi-meter	Scales 0-20, 0-100 Ma. Full scale. 1 MA, DC. 5000 ohms	Weston Model 301 Square	
M2	P. A. Plate Milliammeter	0-300 MA, DC.	Weston Model 301 Square	
M3	Mod. Level	Scale RRCo. Spec. 453-M3. Full scale, 1MA, 1000 cycles, Rectifier Type.	Weston Model 301 Square	
M4	Mod. Cathode Milliammeter	0-300 Ma, DC	Weston Model 301 Square	
M5	Main Plate Voltmeter	0-500 volts, DC	Weston Model 301 Square	
M6	Aux. Plate Voltmeter	0-500 volts, DC	Weston Model 301 Square	

Symbol	Name or Function	Description	Mfr.	Ident.
P1	Line Pilot	Pilot receptacle, smooth amber jewel	Gothard	1001
P2	Fil. Pilot	Pilot receptacle, smooth green jewel	Gothard	1001
P3	Plate Pilot	Pilot receptacle, smooth red jewel	Gothard	1001
P1-P2 P3	Pilot Lamps.	120 volt miniature Lamp	Herzog or Sylvania	HV-6 S-6
R1	Osc. Grid	50,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R2	Osc. Cathode	1,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R3	1st Mult. Grid	50,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R4	2nd Mult. Grid	75,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R5	3rd Mult. Grid	15,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R6	3rd. Mult. Cathode	500 ohms, 25 watts, ±10%	Ohmite or Lectrohm	
R7	3rd. Mult. Screen	20,000 ohms, 25 watts, ±10%	Ohmite or Lectrohm	
R8	P. A. Grid	5,000 ohms, 1 watt, ±10%	IRC or Stackpole	
R9	P. A. Grid	5,000 ohms, 1 watt, ±10%	IRC or Stackpole	

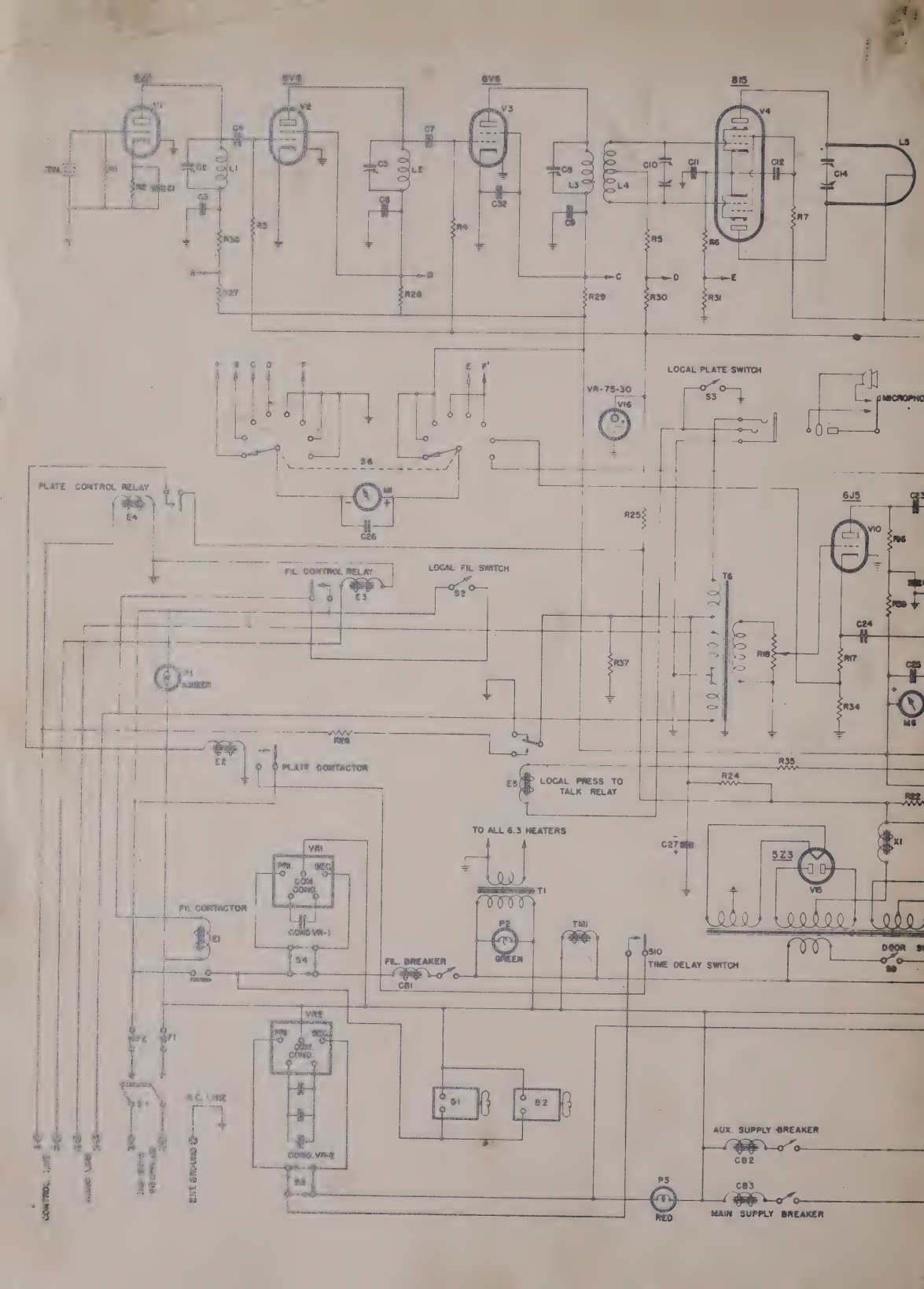
Symbol	Name or Function	Description	Mfr.	Ident.
R10	P. A. Screen	7,500 ohms, 50 watts, ±10%	Ohmite or Lectrohm	
R11	P. A. Dropping	1,000 ohms, 50 watts, ±10%	Ohmite or Lectrohm	
R12	3rd. Mult. Dropping	2,000 ohms, 50 watts, ±10%	Ohmite or Lectrohm	
R13	Mod. Cathode	500 ohms, 1 watt, ±20%	IRC or Stackpole	
R14	Mod. Grid	500,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R15	Mod. Grid	500,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R16	Audio Amp. Plate	5,000 ohms, 1 watt, ±10%	IRC or Stackpole	
R17	Audio Amp. Cathode	4,500 ohms, 1 watt, ±10%	IRC or Stackpole	
R18	Gain Control	100,000 ohms, "S" Taper Potentiometer	Clarostat	37-100,000-S
R19	Main Supply Bleeder	2,000 ohms, 25 watts, ±10%	Ohmite or Lectrohm	
R20	Main Supply Bleeder	5,000 ohms, 50 watts, ±10%	Ohmite or Lectrohm	
R21	Aux. Supply Bleeder	10,000 ohms, 25 watts, ±10%	Ohmite or Lectrohm	
R22	Bias Supply Bleeder	~~500~~ 650 ohms, 10 watts, ±10%	Ohmite or Lectrohm	

Symbol	Name or Function	Description	Mfr.	Ident.
R23	Bias Supply Bleeder	~~600~~ 500 ohms, 10 watts, ±10%	Ohmite or Lectrohm	
R24	Micro. Dropping	~~250~~ 500 ohms, 25 watts, ±10%	Ohmite or Lectrohm	
R25	Bias Isolating	50,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R26	Plate Relay Dropping	~~100~~ 50 ohms, ~~1~~ 2 watt, ~~±20%~~ ±5%	IRC ~~or Stackpole~~	
R27	Osc. Plate Metering	250 ohms, 1 watt, ±5%	IRC or Stackpole	
R28	1st. Mult. Plate Metering	50 ohms, 1 watt, ±5%	IRC or Stackpole	
R29	2nd. Mult. Plate Metering	50 ohms, 1 watt, ±5%	IRC or Stackpole	
R30	3rd. Mult. Grid Metering	250 ohms, 1 watt, ±5%	IRC or Stackpole	
R31	3rd. Mult. Cathode Metering	25 ohms, 1 watt, ±5%	IRC or Stackpole	
R32	P. A. Grid Metering	250 ohms, 1 watt, ±5%	IRC or Stackpole	
R33	Audio Driver Cathode Metering	50 ohms, 1 watt, ±5%	IRC or Stackpole	
R34	Audio Amp. Cathode Metering	250 ohms, 1 watt, ±5%	IRC or Stackpole	
R35	Press to Talk Relay Dropping	~~15,000~~ 10,000 ohms, 1 watt, ±20%	IRC or Stackpole	

Symbol	Name or Function	Description	Mfr.	Ident.
R36	Mod. Level Meter Dropping	450,000 ohms, 1 watt, ±5%	IRC or Stackpole	
R37	Micro. Supply Bleeder	300 ohms, 2 watt, ±20%	IRC or Speer	
R38	Osc. Plate Dropping	10,000 ohms, 1 watt, ±20%	IRC or Stackpole	
R39	Audio Plate Dropping	10,000 ohms, 1 watt, ±20%	IRC or Stackpole	
RFC1	Mod. Plate Suppressor	Spec. 453-RFC-1	RRCo.	
RFC2	Mod. Plate Suppressor	Spec. 453-RFC-1	RRCo.	
S1	Main Power Switch	D.P.S.T. Power Switch	P & S	1312
S2	Fil. Control Switch	S.P.S.T. Power Switch	P & S	1311
S3	Plate Control Switch	S.P.S.T. Power Switch	P & S	1311
S4	Multimeter Switch	2 gang, 2 pole, 8 positionHW,XXP	Centralab	RR Dwg B-155-18B
S5	Fil. Regulator Switch	4 way, Power Switch	P & S	1314
S6	Plate Regulator Switch	4 way, Power Switch	P & S	1314
S7	Tune Operate Switch	D.P.S.T. Power Switch	P & S	1312
S8	Door Switch	Micro-switch	Micro	YZRL-8
S9	Door Switch	Micro-switch	Micro	YZRL-8

Symbol	Name or Function	Description	Mfr.	Ident.
S10	Time Delay Switch	Micro-switch	Micro	YZRS-8
S11	Door Switch	Micro-switch	Micro	YZRL-8
T1	Fil.	Pri. 115 v. 60 cycles, Sec. 6.4 V. 8 Amps.	Thordarson	T47164
T2	Bias and Fil.	Pri. 115V 60 cycles, Sec.#1. 5V. 3 Amps. CT, Sec.#2 5V. 3 Amps. CT, Sec. #3 135-0-135V., .16 Amps. DC.	Thordarson	T47165
T3	Aux. Supply Plate	Pri. 115V. 60 cycles, Sec.360-0-360V., .25 Amps, DC.	Thordarson	T47166
T4	Main Supply Fil.	Pri. 115 V. 60 Cycles, Sec. 5V. 9 Amps.	Thordarson	T47167
T5	Main Supply Plate	Pri. 115V. 60 cycles, Sec. 540-0-540V., .65 Amps. DC.	Thordarson	T47168
T6	Micro. and Line Input	Pri. 30-600 ohms, CT., Sec. 100,000 ohms	Thordarson	T47368
T7	Audio Driver	Pri. Push-pull 6J5, Sec. Class AB2,807.	Thordarson	T47170
T8	Modulation	Pri. Class AB2,807, Sec. 1770 ohms	Thordarson	T-47171
TM1	Timing Motor	115V. 60 cycles 1RPM Clockwise, 3/16"x$\frac{1}{2}$" shaft	Haydon	1601-1160-R
V1	Osc.	Type 6J5	RCA	

Symbol	Name or Function	Description	Mfr.	Ident.
V2	1st. Mult.	Type 6V6	RCA	
V3	2nd. Mult.	Type 6V6	RCA	
V4	3rd. Mult.	Type 815	RCA	
V5	Power Amp.	Type 829	RCA	
V6	Modulator	Type 807	RCA	
V7	Modulator	Type 807	RCA	
V8	Audio Driver	Type 6J5	RCA	
V9	Audio Driver	Type 6J5	RCA	
V10	Audio Amp	Type 6J5	RCA	
V11	Main Supply Rect.	Type 5Z3	RCA	
V12	Main Supply Rect.	Type 5Z3	RCA	
V13	Main Supply Rect.	Type 5Z3	RCA	
V14	Aux. Supply Rect.	Type 5Z3	RCA	
V15	Bias Supply Rect.	Type 5Z3	RCA	
V16	Bias Regulator	Type VR-75-30	RCA	
VR1	Fil. Regulator	Pri. 95-130 V 60 cycles, Sec. 115V. 150 VA., supplied with external condenser	Thordarson	T-47175


6J5
6V6
6V6
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V2
V3
V4
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L2
L3
L4
L5
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C14
C32
R1
R2
R3
R4
R5
R6
R7
R26
R27
R28
R29
R30
R31
A
B
C
D
E
LOCAL PLATE SWITCH
S3
VR-75-30
V16
MICROPHO
S6
PLATE CONTROL RELAY
E4
M
C26
R25
6J5
V10
R36
C23
FIL. CONTROL RELAY
E3
LOCAL FIL. SWITCH
S2
T6
C24
R18
R17
R37
R34
C25
M6
P1
AMBER
R25
E2
PLATE CONTACTOR
E5
LOCAL PRESS TO
TALK RELAY
R35
R24
R22
TO ALL 6.3 HEATERS
C27
5Z3
V15
X1
VR1
PRI.
SEC.
COM.
COND.
T1
FIL CONTACTOR
E1
COND. VR-1
S4
P2
GREEN
TH1
FIL. BREAKER
CB1
S10
TIME DELAY SWITCH
DOOR SW
S9
VR2
F1
F2
S1
S5
S6
S7
S8
A.C. LINE
S11
S12
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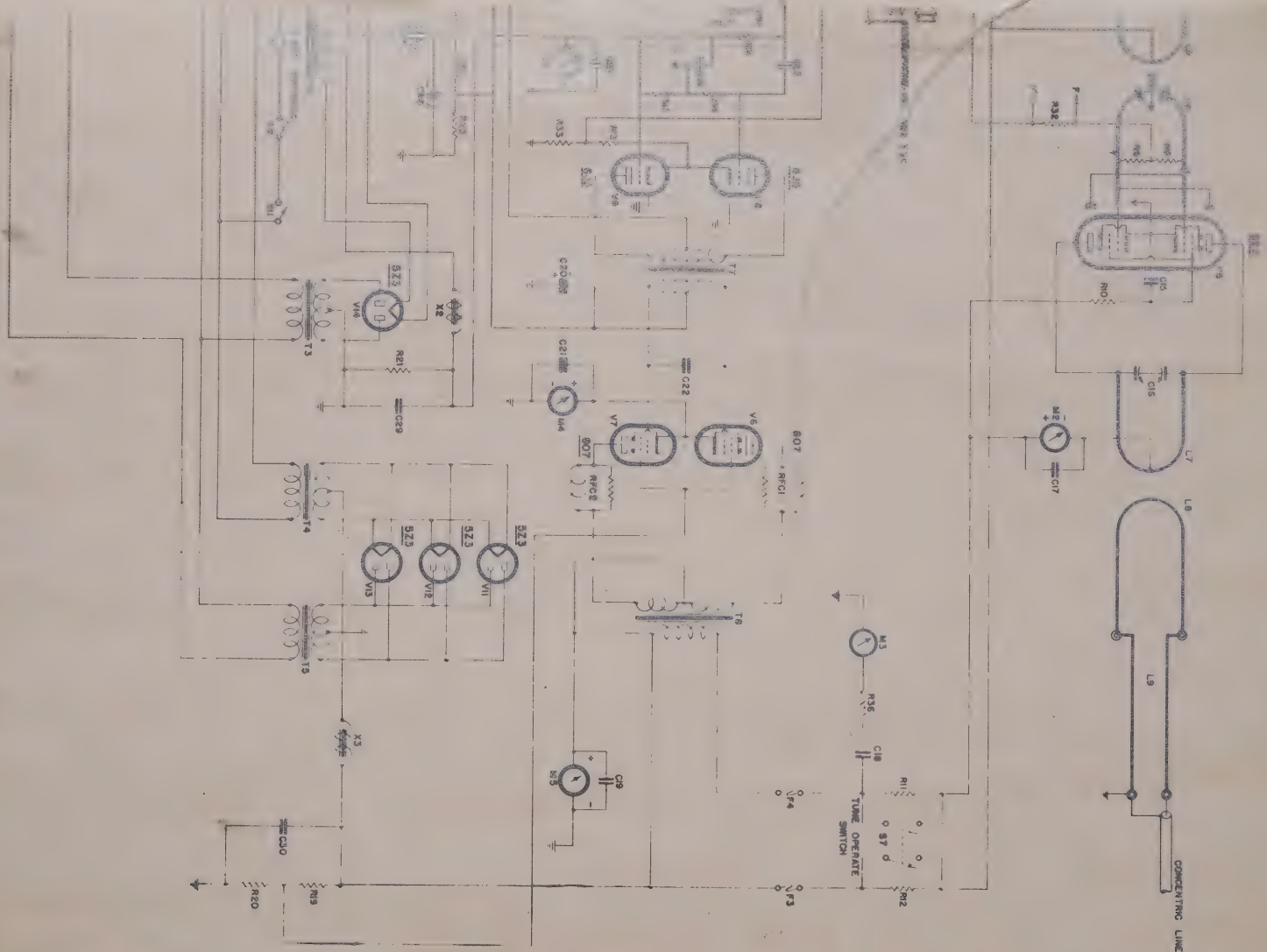
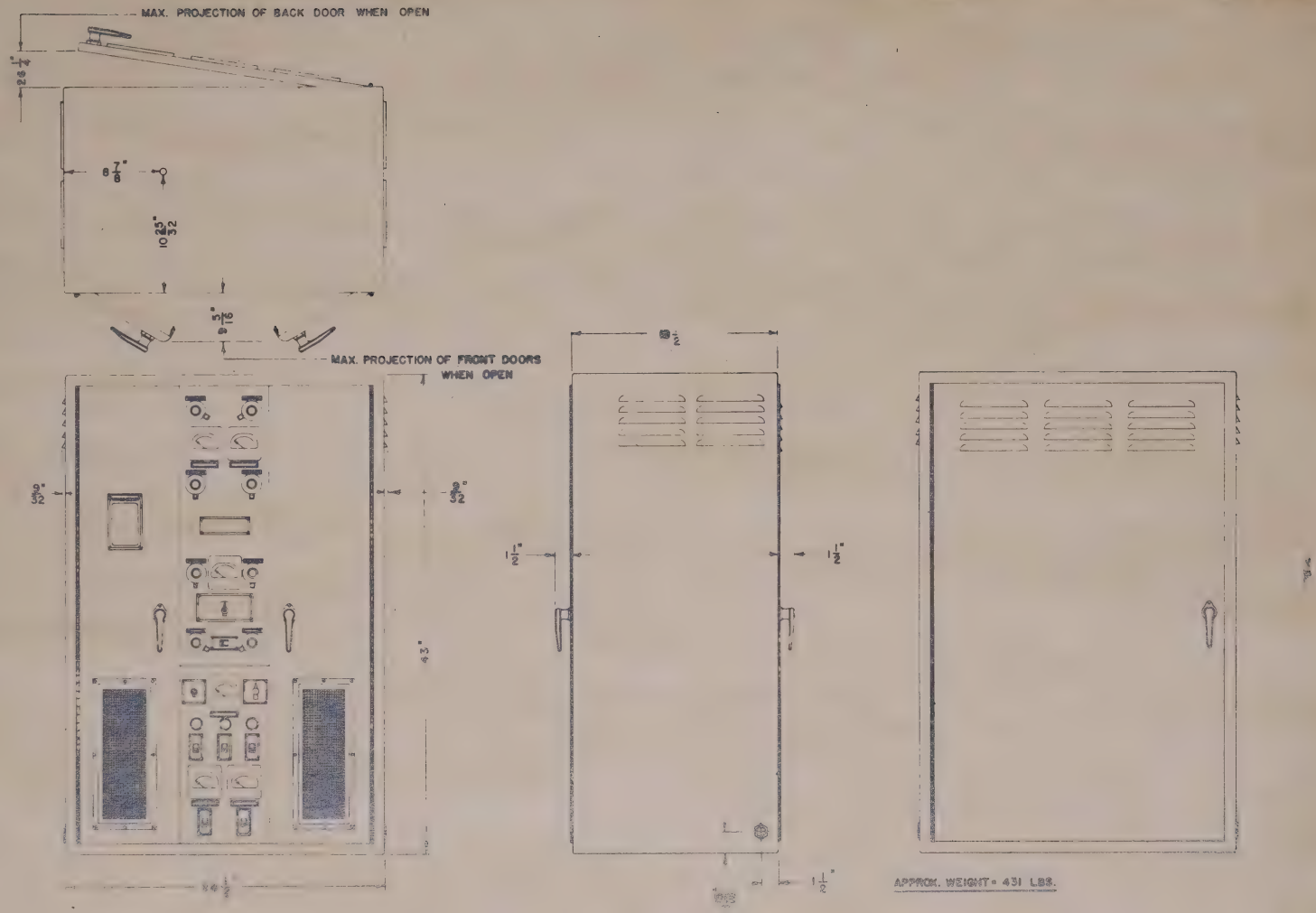


Figure 2 Radio Transmitter, BC-797-A(B) Circuit Schematic


MAX. PROJECTION OF BACK DOOR WHEN OPEN
MAX. PROJECTION OF FRONT DOORS WHEN OPEN
APPROX. WEIGHT = 431 LBS.

Symbol	Name or Function	Description	Mfr.	Ident.
VR2	Plate Regulator	Pri. 95-130 V 60 cycles, Sec. 115V. 400 VA., supplied with external condensers	Thordarson	T-47176
X1	Bias Supply Reactor	2.5 Henries, ~~.16~~ .25 Amps.	Thardarson	T47172
X2	Aux. Supply Reactor	11 Henries, ~~.25~~ .16 Amps.	Thordarson	T47173
X3	Main Supply Reactor	7.5 Henries, .65 Amps.	Thordarson	T-47174

34. PARTS LIST RM-31-A(B)

Symbol	Name or Function	Description	Mfr.	Ident.
C1R	Filter	50 mfd., plug in electrolytic 100 V. DC. W.	Solar	
C2R	Micro. Filter	200 mfd., plug in electrolytic 50 V. DC. W.	Solar	
C3R	Meter Blocking	4 mfd., paper -20%+100%, 100V. DC. W.	Solar	XDRHW-1-4
E1R	Press to Talk Relay	1 Form A, 1 Form B, 6500 ohm DC. coil	Clare	B-11357
F1R	Line Fuse	1 amp. 250 volts	Bussman	4AG
J1R	Micro. Jack	Telephone Type Jack	W.E. Co.	246-E
M1R	Level Meter	Scale RRCo. Spec. 453-M3, Full scale. 1MA, 1000 cycles, Rectifier Type	Weston	Model 301 Square
P1R	Line Pilot	Pilot receptacle	Automatic	
P2R	Fil. Pilot	Pilot receptacle	Automatic	
P3R	Plate Pilot	Pilot receptacle	Automatic	

Symbol	Name or Function	Description	Mfr.	Ident.
P1R	Pilot Lamp	6 volt. Type DB-58	Automatic	
P2R	Pilot Lamp	35 volt Type DB-76 (35A2)	Automatic	
P3R	Pilot Lamp	35 volt Type DB-76 (35A2)	Automatic	
R1R	Micro. Dropping	400 ohms, 25 watts, ±10%	Ohmite or Lectrohm	
R2R	Micro. Level	5-500 ohms, "L" Taper Volume Control	Clarostat	P-58
R3R	Meter Multiplier	2,500 ohms, 1 watt, ±5%	IRC or Stackpole	
R4R	Micro. Bleeder	300 ohms, 2 watts, ±20%	IRC or Speer	
S1R	Line switch	S.P.S.T. Power Switch	P & S	1311
S2R	Fil. switch	S.P.S.T. Power Switch	P & S	1311
S3R	Plate switch	S.P.S.T. Power Switch	P & S	1311
T1R	Power Trans.	Pri. 115 v. 60 cycles, Sec#1 5V. 3 Amps., Sec#2 75-0-75V., .25 Amps. DC.	Thordarson	T-47177
T2R	Micro. to Line Trans.	Pri. 30 ohms, Sec. 600 ohms, CT.	Thordarson	T-47369
V1R	Rectifier	Type 5Z3	RCA	
X1R	Filter Reactor	2.5 Henries, .25 Amps	Thordarson	T-47172

35. LIST OF MANUFACTURERS

Symbol	Name	Address
Allied	Allied Control Co.	127 Fulton Street, New York, N. Y.
Automatic	American Automatic Electric Sales Co.	1033 W. Van Buren Street, Chicago, Ill.
Bussman	Bussman Mfg. Co.	53 Park Place, New York, N.Y.
Centralab	Centralab Inc.	900 Keefe Street, Milwaukee, Wisconsin
Clare	Clare & Co.	4719 W. Sunnyside Ave. Chicago, Ill.
Clarostat	Clarostat Mfg. Co.	285 North 6th Street, Brooklyn, N. Y.
F. A. Smith	F. A. Smith Mfg. Co.	P. O. Box 509, Rochester, N. Y.
Gothard	Gothard Mfg. Co.	1300 North 9th Street, Springfield, Ill.
Haydon	Haydon Mfg. Co.	Forestville, Conn.
Heinemann	Heinemann Circuit Breaker Co.	98 Plum Street, Trenton, N. J.
Herzog	Herzog Miniature Lamp Works	12-19 Jackson Avenue, Long Island City, N. Y.
Hygrade	Sylvania Corp.	Emporia, Pennsylvania
IRC	International Resistance Corp.	401 North Broad Street, Philadelphia, Pa.
Jefferson	Jefferson Electric Co.	Bellwood, Chicago, Illinois
Johnson	E. F. Johnson Co.	Waseca, Minnesota
Lectrohm	Lectrohm, Inc.	5133 W. 25th Place, Cicero, Ill.
Micro	Micro-Switch Corp.	Freeport, Illinois
Ohmite	Ohmite Mfg. Co.	4929 Flournoy Street, Chicago, Ill.

Symbol	Name	Address
P & S	Pass & Seymour Inc.	Solvay Station, Syracuse, N. Y.
RCA	Radio Corp. of America	Harrison, N. J.
RRCo.	Radio Receptor Company, Inc.	251 W. 19th Street, New York, N. Y.
Solar	Solar Mfg. Co.	Bayonne, N. J.
Speer	Speer Carbon Co.	Lincoln Avenue, St. Mary's, Pa.
Stackpole	Stackpole Resistor Co.	254 West 34th Street, New York, N. Y.
Sylvania	Sylvania Corp.	Emporia, Pa.
Thordarson	Thordarson Electric Mfg. Co.	500 W. Huron Street, Chicago, Illinois
W. E. Co.	Western Electric Co.	195 Broadway, New York, N. Y.
Weston	Weston Electrical Instrument Corp.	639 Frelinghuysen Avenue, Newark, N. J.
W.L.	Ward-Leonard Mfg. Co.	31 South Street, Mt. Vernon, N. Y.

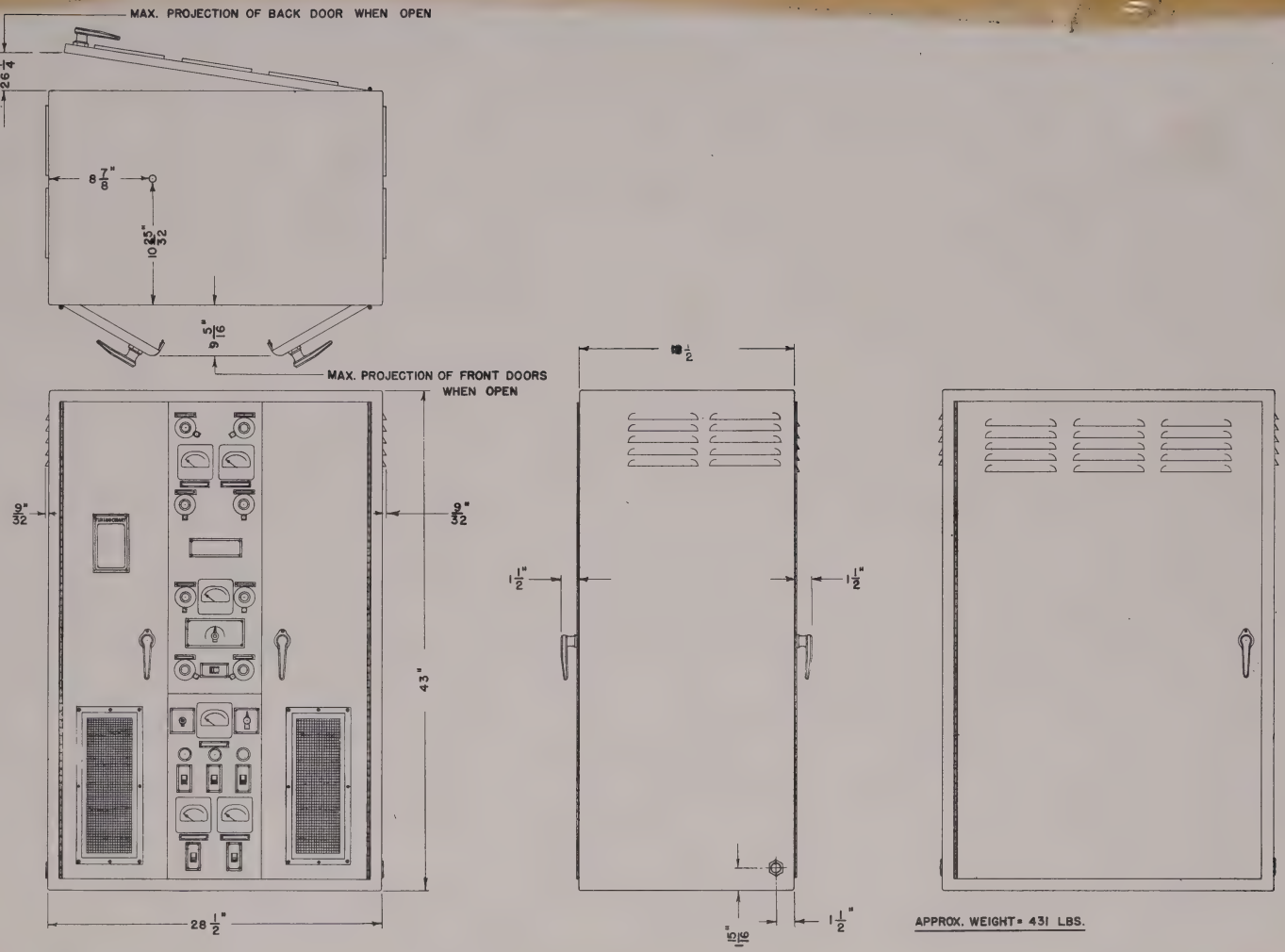


Figure 1 Radio Transmitter, BC-797-A(B) Outline Drawing

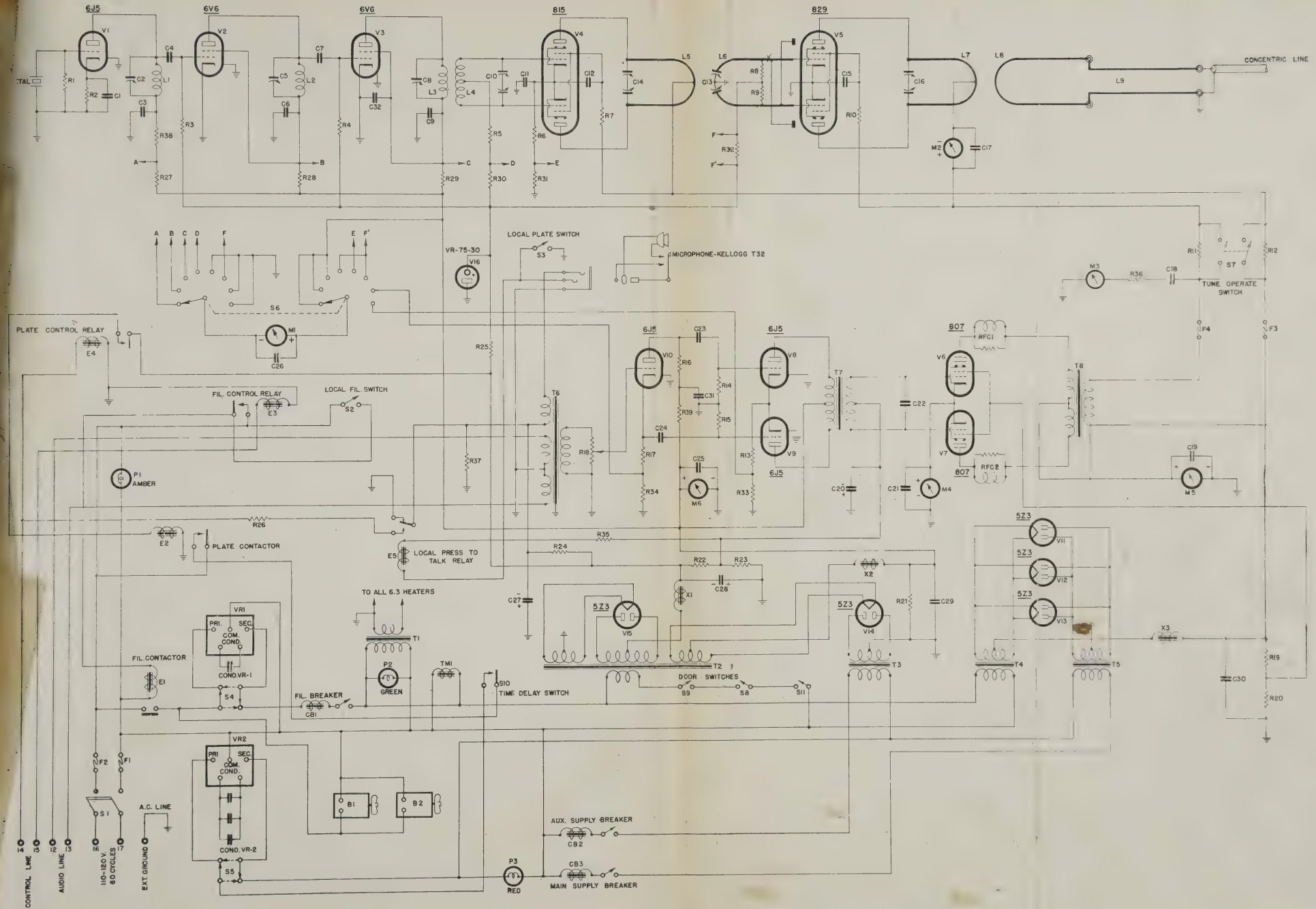


Figure 2 Radio Transmitter, BC-797-A(B) Circuit Schematic

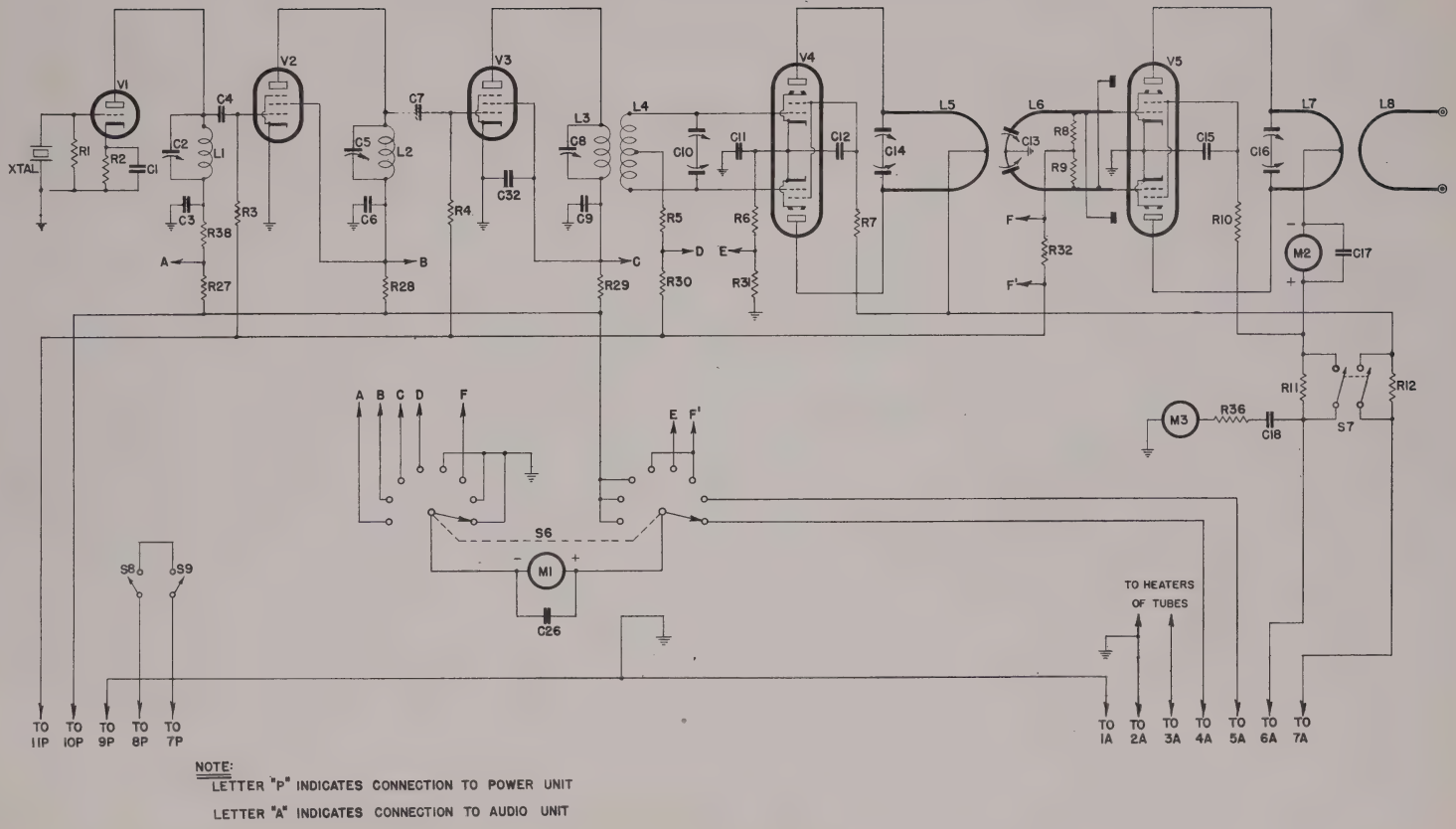


Figure 3 Radio Frequency Unit Schematic

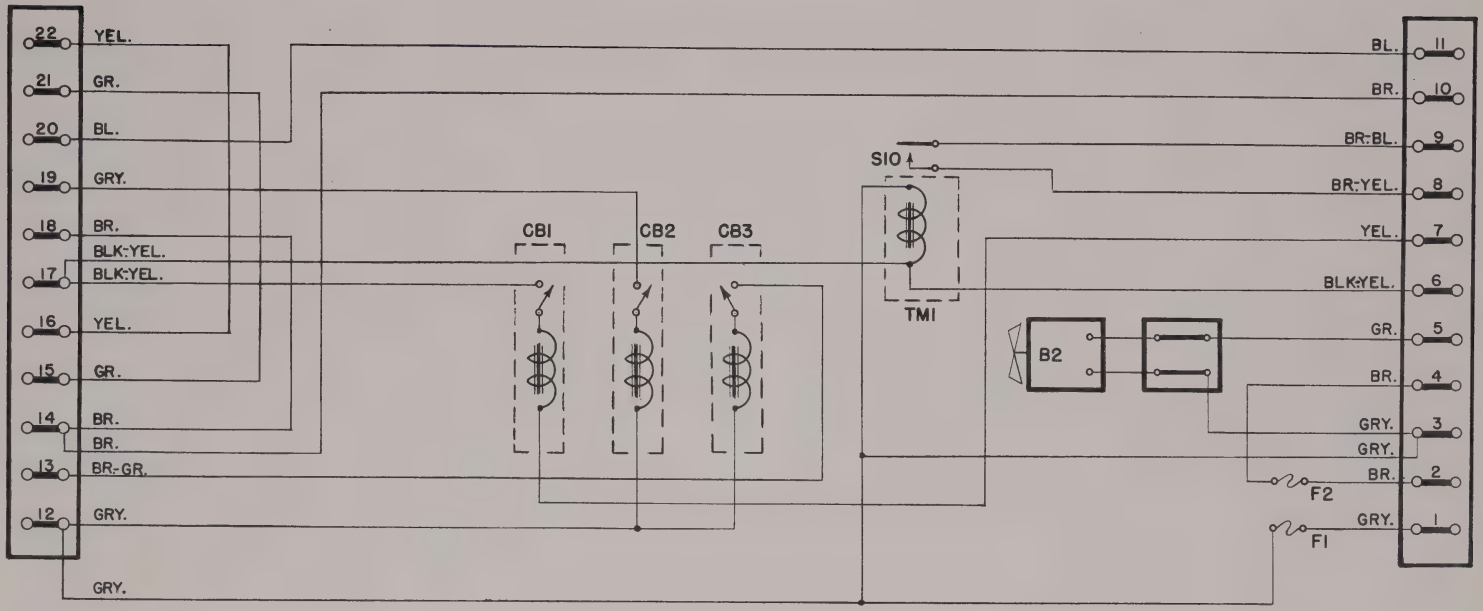


Figure 4 Fuse and Breaker Unit Schematic

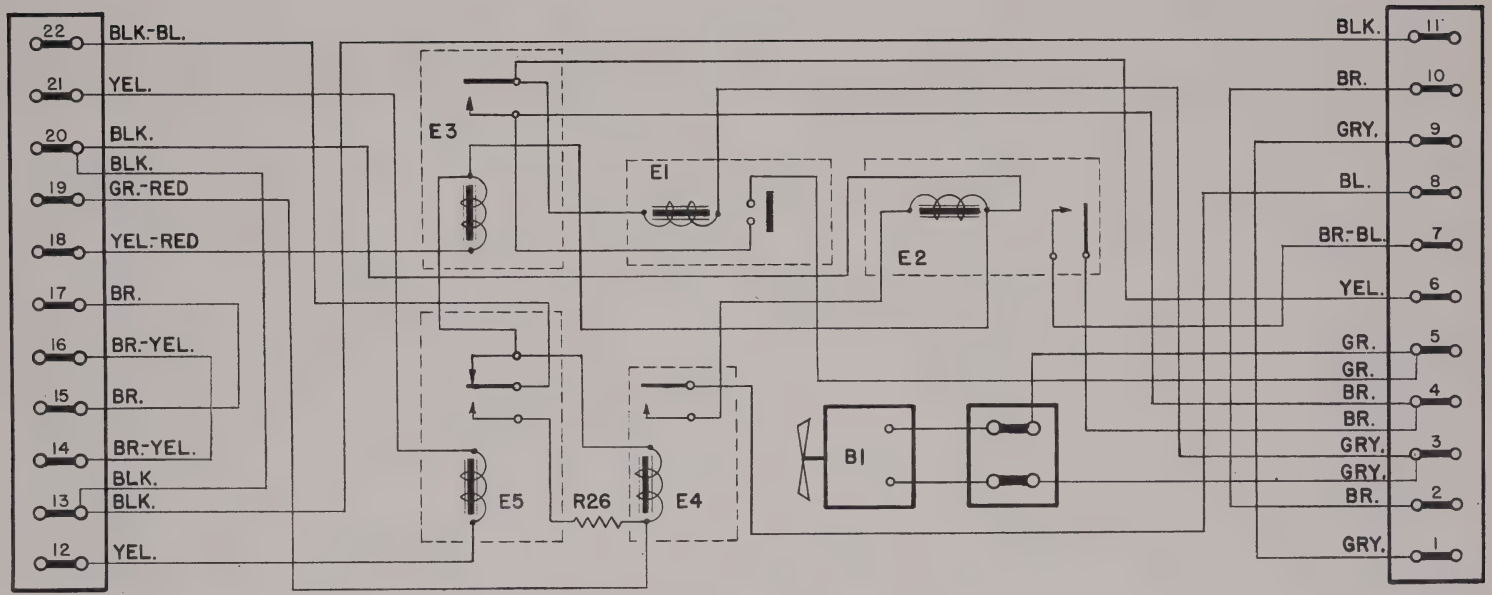


Figure 5 Relay Unit Schematic

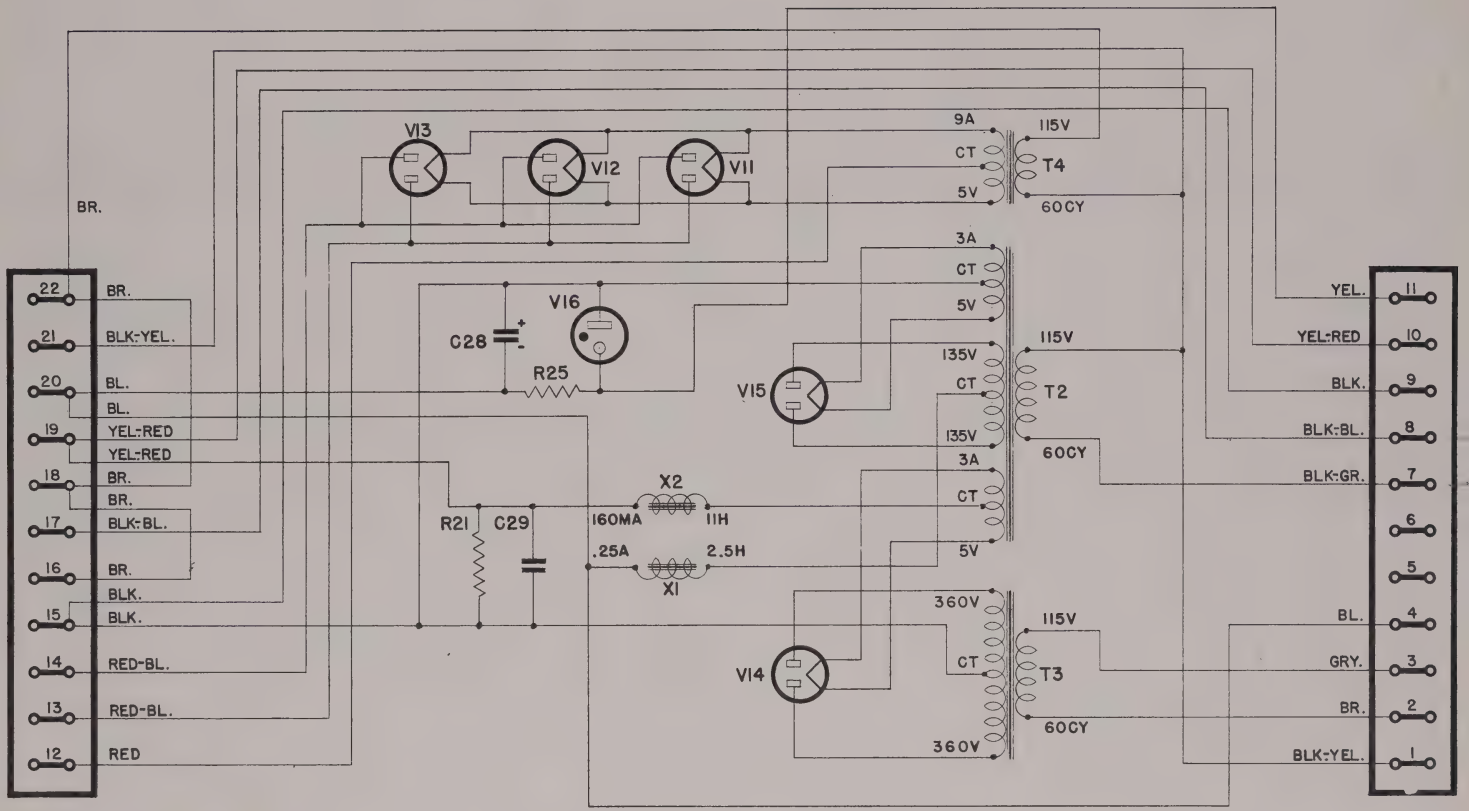


Figure 6 Power Unit Schematic

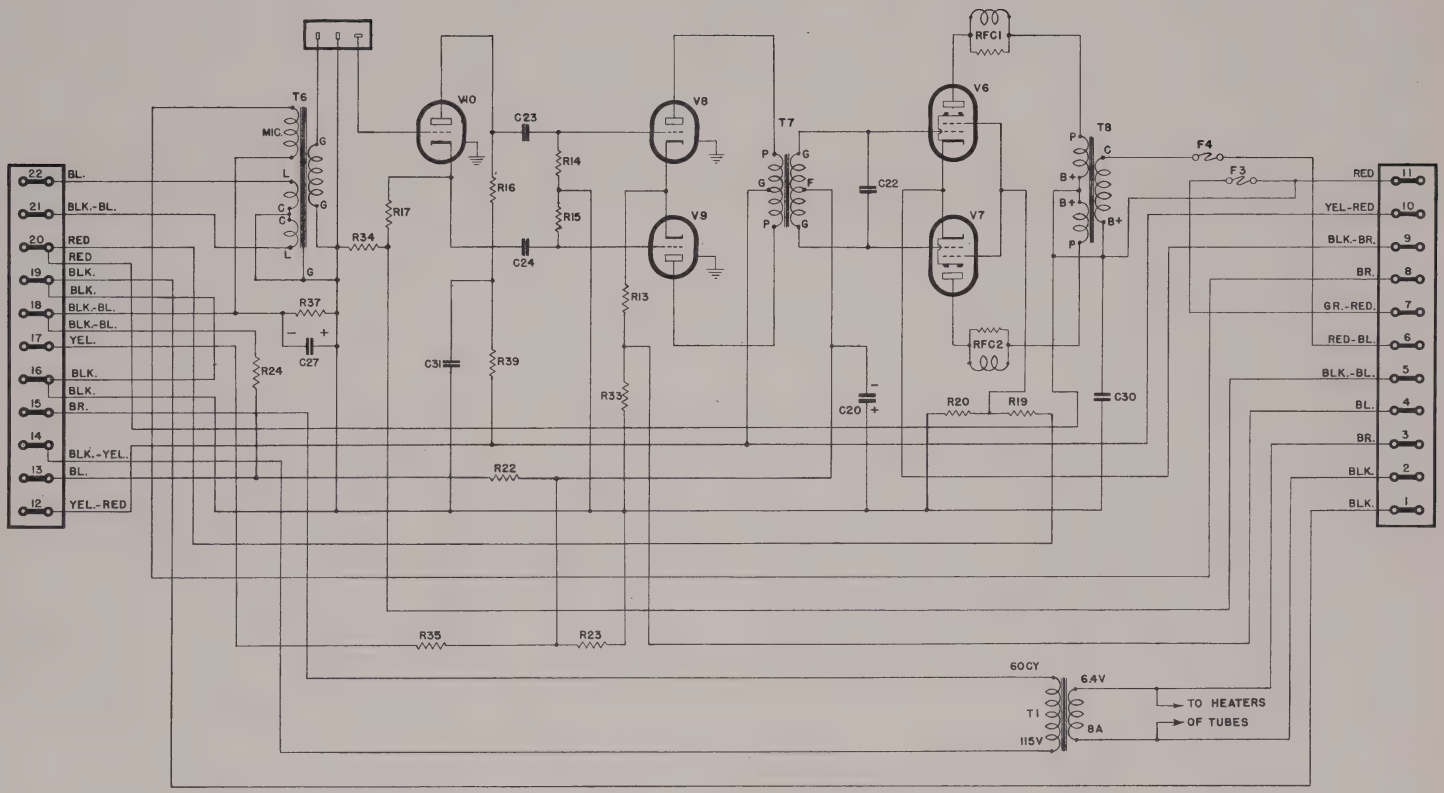


Figure 7 Audio Unit Schematic

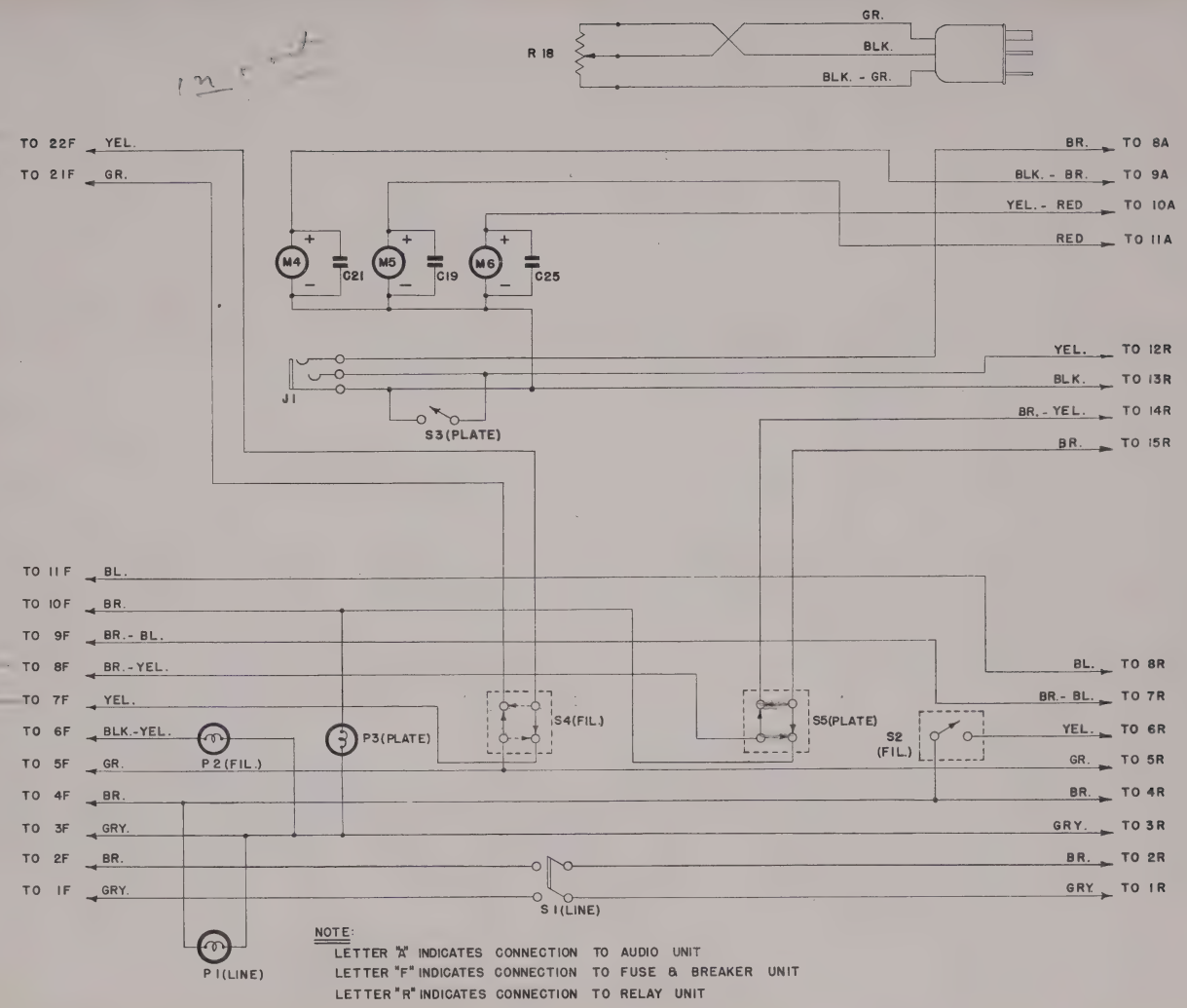


Figure 8 Control Panel Schematic

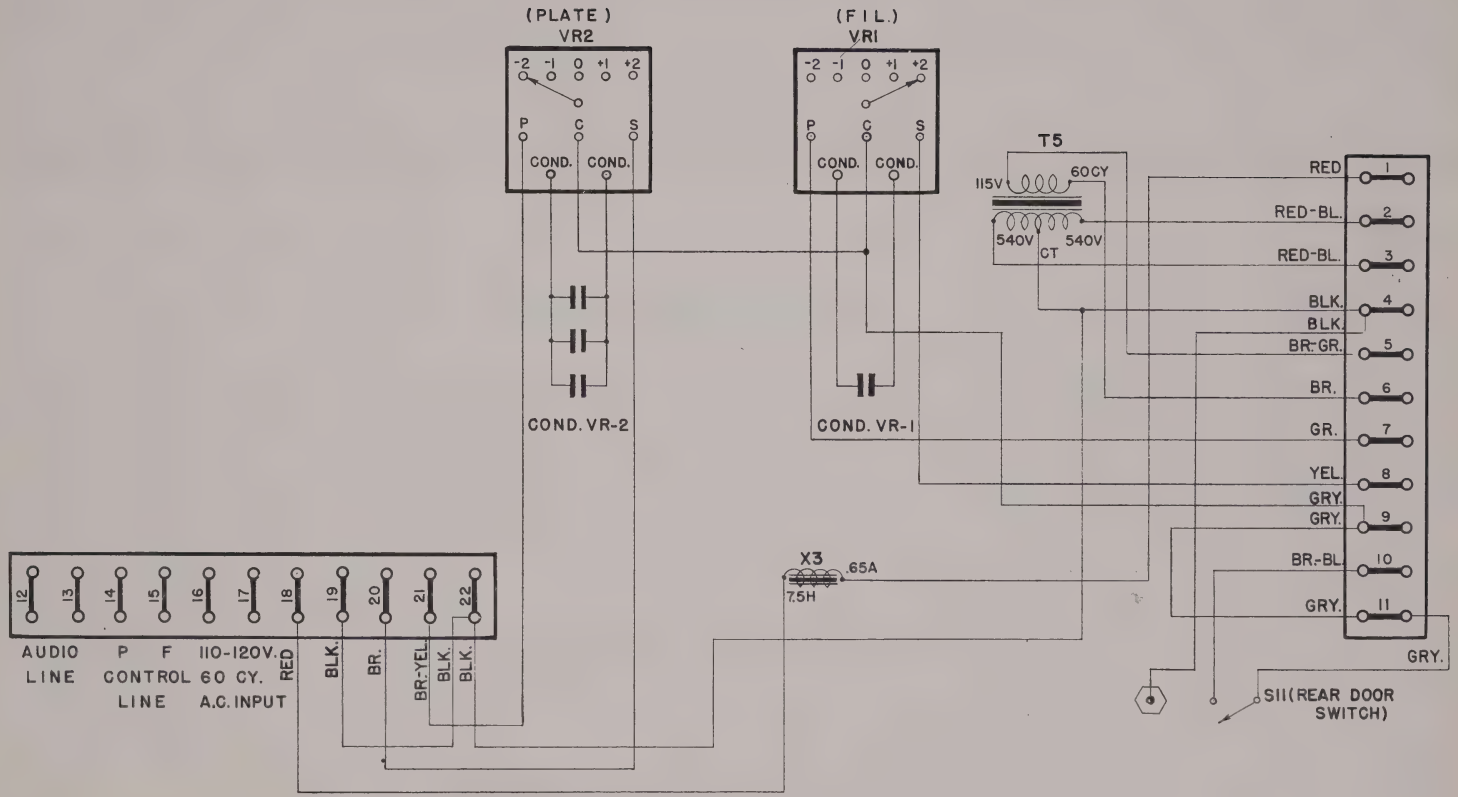


Figure 9 Terminal and Transformer, Schematic

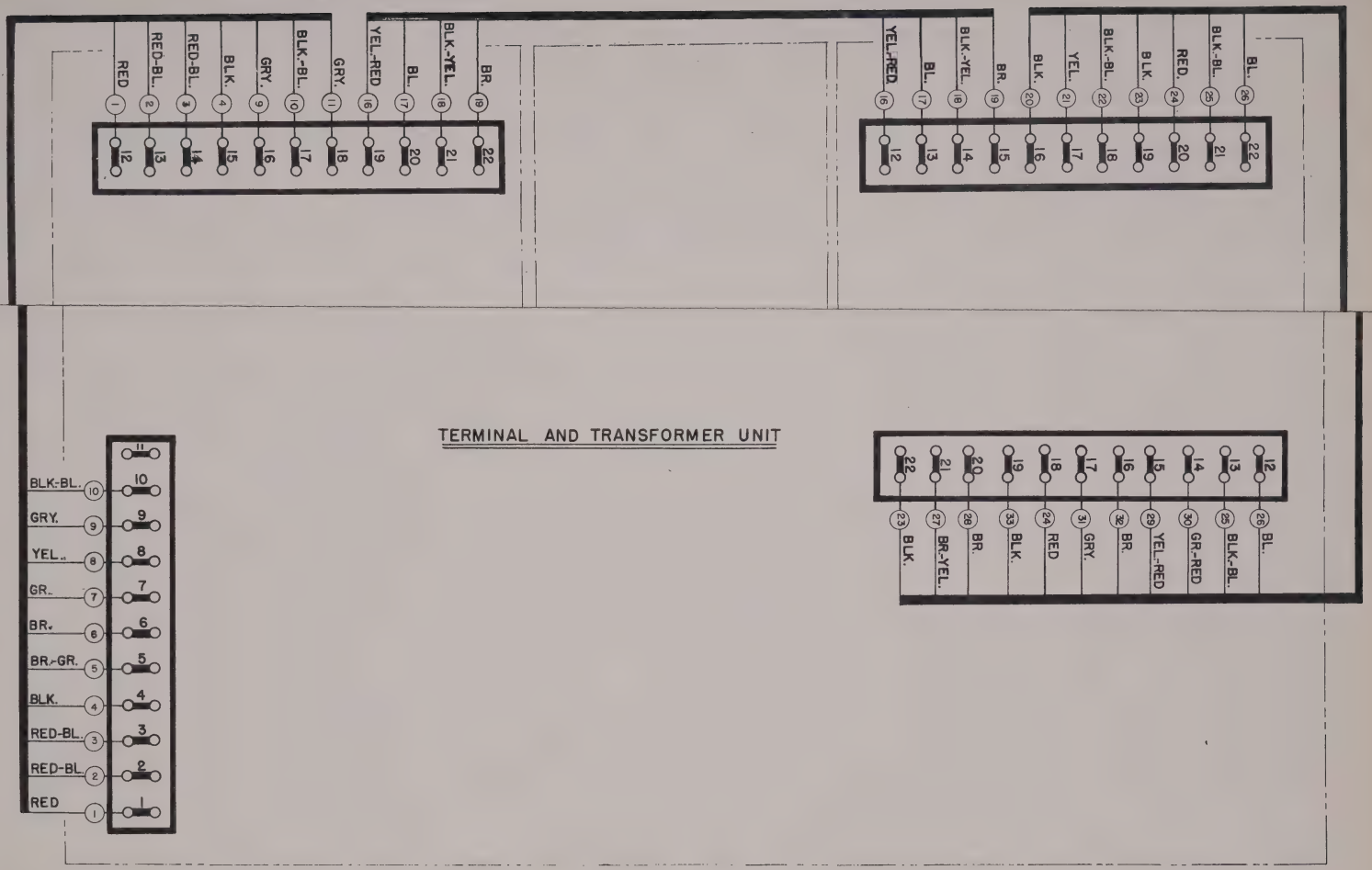
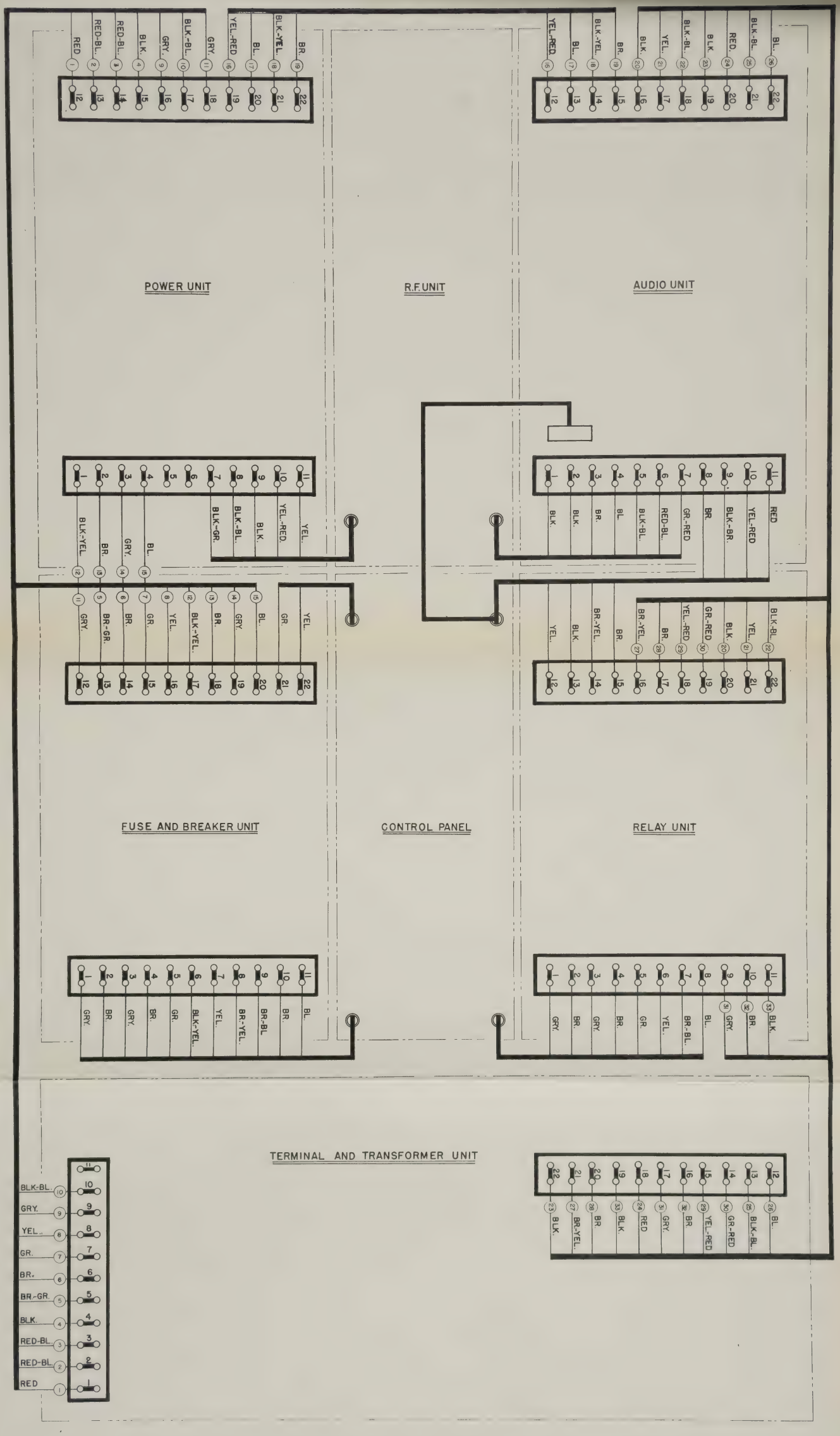


Figure 10 Inter-connecting Cable Diagram


POWER UNIT
R.F. UNIT
AUDIO UNIT
FUSE AND BREAKER UNIT
CONTROL PANEL
RELAY UNIT
TERMINAL AND TRANSFORMER UNIT
RED
RED-BL.
RED-BL.
BLK.
GRY.
BLK-BL.
GRY.
YEL-RED
BL.
BLK-YEL.
BR.
YEL-RED
BL.
BLK-YEL.
BR.
BLK.
YEL.
BLK-BL.
BLK.
RED.
BLK-BL.
BL.
BLK-YEL.
BR.
GRY.
BR.
BL.
YEL.
BLK-GR.
BLK-BL.
BLK.
YEL-RED.
YEL.
BLK.
BLK.
BR.
BL.
BLK-BL.
RED-BL.
GR-RED
BR.
BLK-BR.
YEL-RED
RED
GRY.
BR-GR.
BR.
GR.
YEL.
BLK-YEL.
BR.
GRY.
BL.
GR.
YEL.
BR-YEL.
BLK.
BR.
YEL-RED
GR-RED
BLK.
YEL.
BLK-BL.
GRY.
BR.
GRY.
BR.
GR.
YEL.
BR-BL.
BL.
GRY.
BR.
BLK.
BLK.
BR.
BLK-BL.
BL.
BLK.
BR-YEL.
BR.
BLK.
BR-YEL.
BLK-YEL.
GR.
BR-BL
BR.
BL.
BLK-BL.
GR-RED
BR.
YEL-RED
BLK.
RED
GRY.
BR-YEL.
BLK.
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GR-RED
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YEL-RED
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GRY.
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GRY.
BR.
GR.
YEL.
BR.
BLK.
RED-BL.
RED-BL.
RED

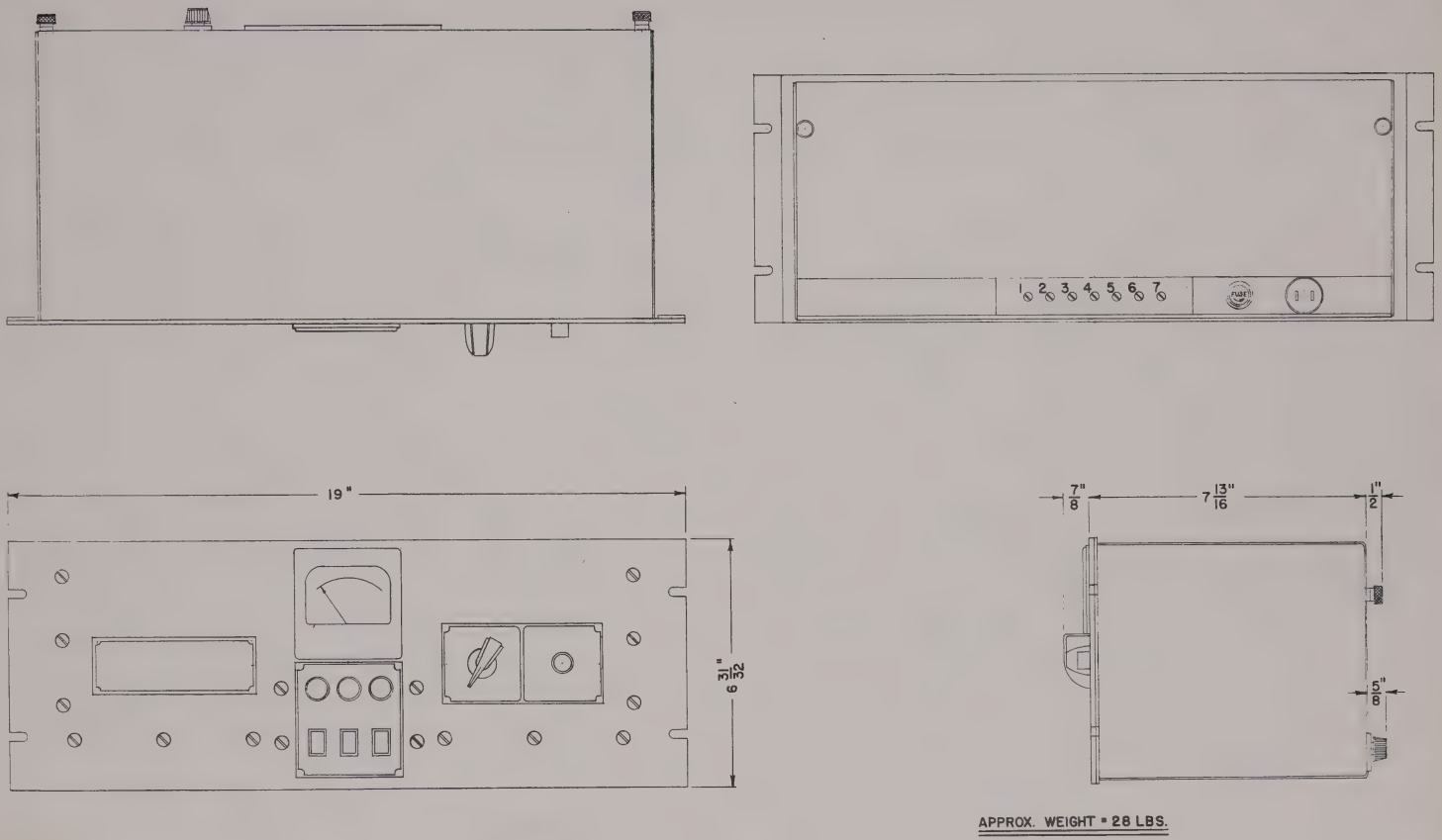


Figure 11 Remote Control Unit, RM-31-A(B) Outline Drawing

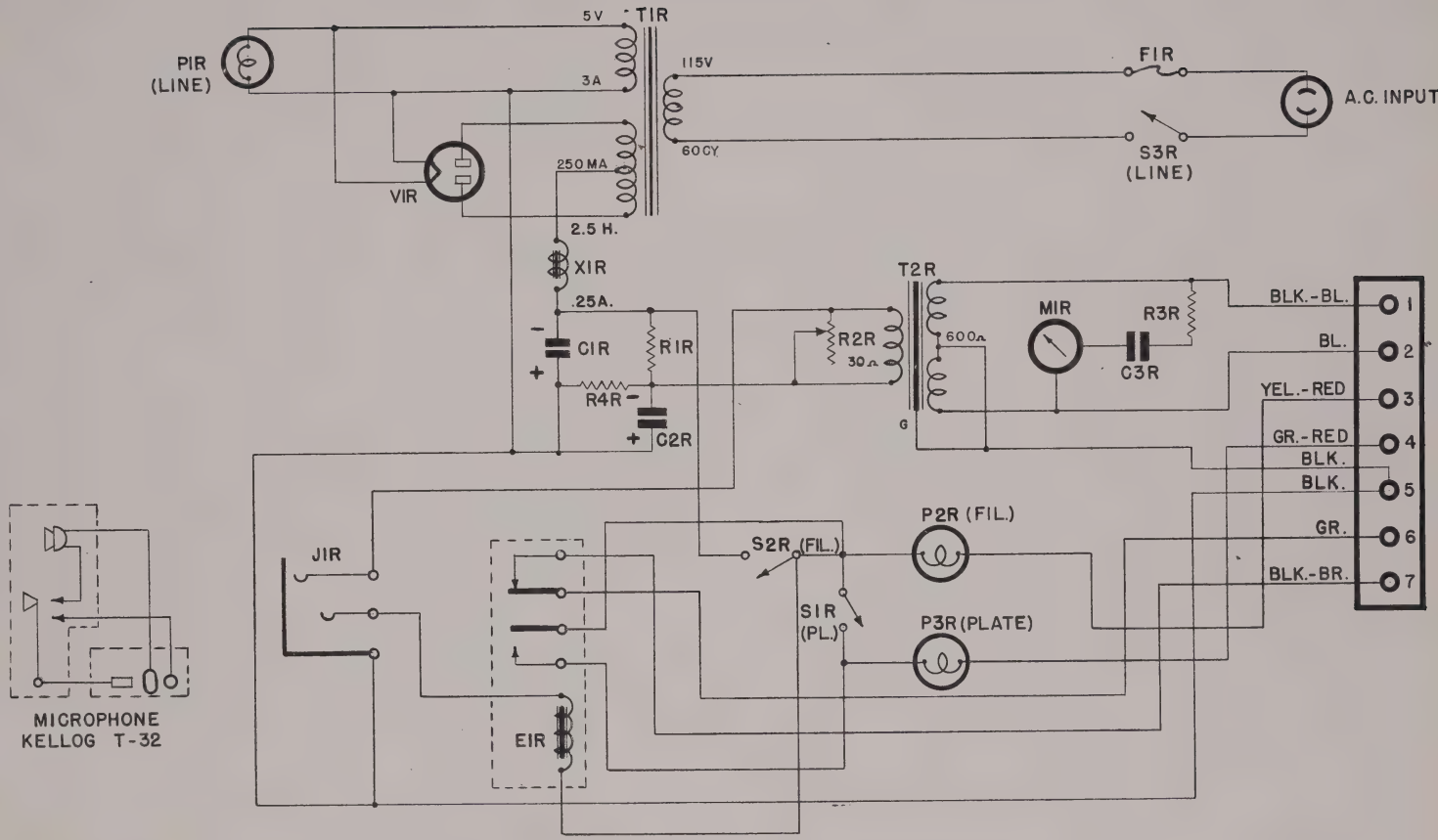
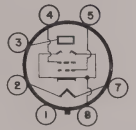


Figure 12 Remote Control Unit, RM-31-A(B) Circuit Schematic

6V6

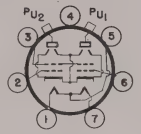
BOTTOM VIEW



PIN 1- SHELL
PIN 2- HEATER
PIN 3- PLATE
PIN 4- SCREEN
PIN 5 - GRID
PIN 7- HEATER
PIN 8- CATHODE

829

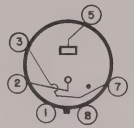
BOTTOM VIEW



PIN 1 - HEATER
PIN 2 - GRID NO.1 OF UNIT NO.2
PIN 3 - SCREEN
PIN 4 - CATHODE
PIN 5 - HEATER CENTER TAP
PIN 6 - GRID NO.1 OF UNIT NO.1
PIN 7 - HEATER
PU1 & PU 2 - PLATE TERMINALS OF
UNITS NO.1 & 2, RESPECTIVELY

VR-75-30

BOTTOM VIEW



PIN 1 - NO CONNECTION
PIN 2 - CATHODE
PIN 3 - JUMPER
PIN 5 - ANODE
PIN 7 - JUMPER
PIN 8 - NO CONNECTION

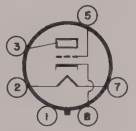
ELECTROLYTIC CONDENSER

BOTTOM VIEW

PIN 1 - NEGATIVE SIDE OF CONDENSER
PIN 2 - POSITVE SIDE OF CONDENSER

6J5

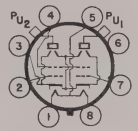
BOTTOM VIEW



PIN 1- SHELL
PIN 2- HEATER
PIN 3- PLATE
PIN 5 - GRID
PIN 7- HEATER
PIN 8- CATHODE

815

BOTTOM VIEW



PIN 1- HEATER
PIN 2- GRID NO.1 OF UNIT NO.2
PIN 3- CATHODE, INTERNAL SHIELD
PIN 4- SCREEN
PIN 5- HEATER CENTER TAP
PIN 6- CATHODE, SEE NOTE
PIN 7- GRID NO.1 OF UNIT NO.1
PIN 8- HEATER
PU1 & PU2- PLATE TERMINALS OF
UNITS NO.1 & 2, RESPECTIVELY

NOTE: - TERMINALS 3 & 6 MUST BE CONNECTED TOGETHER.

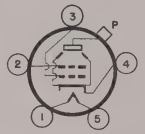
5Z3

BOTTOM VIEW

PIN 1 - FILAMENT
PIN 2 - PLATE
PIN 3 - PLATE
PIN 4 - FILAMENT

807

BOTTOM VIEW



PIN 1 - HEATER
PIN 2 - SCREEN
PIN 3 - GRID
PIN 4 - CATHODE
PIN 5 - HEATER
P — PLATE

Figure 13 Socket Connections

PRELIMINARY INSTRUCTIONS

ASSEMBLY - AIRDROME CONTROL EQUIPMENT

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LIST OF DRAWINGS

Fig. 1. Control Cabinet Assembly, Type 463- Outline Drawing

Fig. 2. Control Cabinet Assembly, Type 463- Interconnecting Cable Diagram

Fig. 3. Control Cabinet Assembly, Type 463- Speaker Panel Schematic

Fig. 4. Antenna, Type 204-B- Mechanical Assembly

Fig. 5. Control Cabinet Antenna System Assembly

Fig. 6. Transmitter Cabinet Antenna System Assembly

Fig. 7. Antenna, Type 204-B- Installation Drawing

PRELIMINARY INSTRUCTIONS

Assembly of Airdrome Control Equipment

I. GENERAL DESCRIPTION

1. PURPOSE.

Type 463 Control Cabinet Assembly and Type 204-B Antenna systems are intended to be a part of a complete Airdrome Control Equipment using Radio Transmitter BC-797-A(B), and Receivers, Radio Receptor Company Type 201-A. Distance between Control-Receiver Cabinet position and transmitter installation should not exceed a wire line distance of 2½ miles.

2. MATERIAL SUPPLIED ON ORDER NUMBER 14471-PHILA-43

a. 1 each Control-Receiver Cabinet Assembly, including speaker panel and interconnecting cables, indentified as, Radio Receptor Company, Type 463 Control Cabinet Assembly.

b. 2 each Radio Receptor Company, Type 204-B Antenna Systems. Each consists of:

1 50-foot coil transmission line with pre-assembled end seals and complete fittings.
1 Dry Air Pump, with dehydrating chamber.
1 Pair splicing connectors.
1 Antenna casting with hardware.
4 Ground plane rods with hardware.
2 Vertical elements and hardware.
1 Adjustable element.
1 Set of wrenches.

3. OTHER ASSOCIATED EQUIPMENT INTENDED TO BE USED WITH ABOVE IS SUPPLIED ON ORDERS: 10472-PHILA-42, 2258-WF-42, 1528-PHILA-43.

1 Radio Transmitter BC-797-A or BC-797-B.
1 Remote Control Unit RM-31-A or RM-31-B.
2 Radio Receptor Company, Type 201-A Receivers.
2 Suitable quartz crystals for receiver operation.
Spare parts and tubes.

4. MATERIAL REQUIRED BUT NOT SUPPLIED.

Not less than one quartz crystal in FT-164 holder, for use in transmitter BC-797-A(B). (Crystal frequency: 1/27 of carrier operating frequency.) 2 pairs of #19 telephone wire of suit-suitable length, for use between transmitter and the control-

receiver cabinet assembly. 2 sections pipe ($1\frac{1}{2}$-$11\frac{1}{2}$ American Standard Thread) 6 feet or more in length, to fit antenna castings and to be used for mounting antenna.

5. BRIEF DESCRIPTION.

a. This unit consists of a cabinet approximately 28 inches high, 21 inches wide and 15 inches deep. Provision is made for mounting 19" relay rack panels. The cabinet is steel, black wrinkle finished. Two hinged doors are provided for accessibility, one at the top of the cabinet for speaker access and one at the back for receiver and Remote Control Unit, both being provided with ring latches. Ventilation is provided through louvred sides. A Burke distribution block at the bottom left of the cabinet provides terminals for A. C. input.

The speaker panel is factory-mounted. Interconnecting wiring and plugs for connection to receivers and remote control unit are installed ready for use.

b. Antenna is folded one quarter wave, with four rods inserted into the base casting at 90° horizontal intervals to form a ground plane. The length of the antenna is adjustable so that it may be tuned through a frequency range of 116 to 127 megacycles. Tuning is effected by adjusting the bent or "trombone" section and each of the ground plane rods.

II. INSTALLATION OF CONTROL-RECEIVER CABINET ASSEMBLY

From top to bottom, units should be arranged in the cabinet as follows:

Speaker Panel.
No. 1 Receiver (Type 201-A)
No. 2 Receiver (Type 201-A)
Remote Control Unit (Type RM-31-A or RM-31-B)

For description of external connections to the receivers and remote control unit refer to the applicable instruction books.

Place the cabinet in position on the operating table. Make connection using #14 or larger wire from the Burke distribution block at the base of the cabinet to a 110-120 volt 60 cycle source of power input.

Erect the antenna as described in Section III, and arrange the transmission line so that the end seal may be inserted in the hole at the top center rear of the Control-Receiver Cabinet. It is imperative that at no time during installation, the transmission line be bent on a radius of

less than 12 inches. Otherwise, the inside conductor may contact the sheath and cause the system to be inoperative.

III. INSTALLATION OF THE ANTENNA SYSTEM

The antenna comes unassembled. The transmission line, 50 feet in length, is furnished with end seals connected, relief valve, pressure gauge, pump fitting (with cap), hardware, and vertical radiator fitting, in place.

1. TO ASSEMBLE THE ANTENNA. Fig. 4

a. Remove top nut (9) and one washer (11) from end seal fitting (13) and insert insulated end of seal through the mounting hole in the antenna casting (1). Replace washer and nut and tighten, locking the assembly together.

b. Loosen set screws in radiator fitting (3) and insert short vertical element (4). Tighten screws with wrench provided.

c. Loosen set screws in stud of antenna casting (1) and insert long vertical element (5) flush with base. Tighten screws.

d. Loosen nuts at ends of vertical elements (4-5) and insert adjustable "trombone" element to position for correct frequency. Tighten nuts.

(NOTE: There are two inscribed lines around each leg of the adjustable elements designating points for frequency setting. The top line, which is also the paint line, is for a setting of 126 megacycles. For this setting the mark should be flush with the ends of the vertical rods. For adjustment to a frequency of 116 megacycles, the adjustable rod should be set with the lower inscribed mark flush with the vertical rods. Thus, shortening the element increases the operating frequency, lengthening the element lowers the operating frequency.)

e. Loosen set screws in four blocks of antenna casting. Insert each of four ground plane rods (2), as shown, flush with block. Tighten set screws. Nuts (8) on the ends of the ground plane rods may be loosened to adjust length of rods according to desired frequency. Tighten nuts after adjustment.

(NOTE: For an operating frequency of 126 megacycles, the four ground plane rods are shortened to the inscribed line which is also the paint line. For 116 megacycle operation, rods are lengthened to the second inscribed line.)

2. ATTACHING TRANSMISSION LINE TO CABINET ASSEMBLY. Fig. 5

To attach the transmission line to the cabinet assembly, remove nut (5), ground lug (3) and one washer from end seal and insert the end seal through the hole in the top of the cabinet. Replace ground lug, washer and nut, locking assembly into place. Remove nut and washer from ceramic insulator stud and install lug (8). Replace washer and nut and tighten. Solder cable lug (8). Replace washer and nut and tighten. Solder cable shielding to lug (3).

3. ATTACHING THE TRANSMISSION LINE TO THE TRANSMITTER. Fig. 6

This is essentially the same operation performed under above instructions (III-2) with the exception that, the ground lug of the transmitter end seal is soldered to the loading tank coil on the loop nearest the rear of the transmitter. The insulated lug is soldered to the loop nearest the front of the transmitter.

4. MOUNTING ANTENNA.

The antenna may be mounted to a wooden pole fitted to a $1\frac{1}{2}$-inch pipe ($1\frac{1}{2}$-$11\frac{1}{2}$ American Standard Thread) 6 feet or more in length. It is desirable for the installation to be accessible for repair and inspection at frequent intervals. Transmission line should be fastened to the pole at intervals, precaution against crushing being observed. After installation the transmission line should be given several even coats of suitable outside paint. THE TRANSMISSION LINE SHOULD NOT BE SHORTENED. In the event the line is found to be too long for the necessary installation, it should preferably not be shortened, but should be neatly coiled and a fastening arranged near the point where it merges into the transmission room. Should it be found absolutely necessary to cut or repair the transmission line, a pair of splicing connectors are furnished for the operation.

There are several ways of cutting the copper shielding. It is most advisable to use a pipe cutter, although a hacksaw or file may be used. Care should be exercised in keeping the work free of chips, burrs or filings.

(1) Determine exact point of splice.
(2) Cut shielding carefully and clip conductor.
(3) Cut and remove $\frac{1}{2}$-inch section from each end of shielding.

(4) Clean ends of shielding and tin carefully with solder.
(5) Tin large diameter splicing conductor.
(6) Place large splicing connector over wire and slip back along shielding.
(7) Splice wires using small diameter splicing connector and solder.
(8) Move large connector into place over the open section.
(9) Sweat one end of connector into place using holes provided for application of solder.
(10) Wrap soldered end with damp cloth and solder remaining end of shielding to connector.

A torch may be required for the operation. If a spacer bead is attached to the portion of the inner conductor exposed, where the splice is desired, break the bead off with a pair of pliers and remove crimp marks on the conductor. The cable should not be bent near the connection.

The antenna should be placed as high as possible above surrounding objects, bearing in mind that the maximum length of transmission line supplied is 50 feet. If the transmitter and control receiver installations are to be located in the same or adjacent buildings, it is desirable that the transmitter and receiver antennae be placed at least 50 feet apart.

Should the copper elements of the assembly become bared, they should be given a coat of gray glyptal to prevent corrosion.

5. USE OF THE PRESSURE PUMP. Fig. 7

The transmission line is furnished prepared for use. The pressure gauge should show a reading of 15 pounds. This pressure should never fall below 5 pounds, the relief valve should be opened and dry air forced through the line for a minute or two. The pump is connected by removing the valve cap of the fitting (12 Fig. 5-6) and screwing on the pump hose connection. After air has been pumped through the line, the relief valve should be closed and pressure pumped up to over 20 pounds. Releasing the hose connection will cause pressure to drop several pounds, so allowance must be made to realize the suggested 15 pounds of pressure.

6. CARE OF PRESSURE PUMP.

Equipment for the pressure pump consists of an automobile tire pump and a dehydrator tube for the purpose of removing moisture from the air emitted from the discharge tube. In a moderate climate at ordinary humidity, the

dehydrator will remove all the moisture from 200 cubic feet of free air. In a cold dry climate its capacity may be doubled; in hot humid climate its capacity may be halved.

As supplied, the dehydrator is charged with one pound of telltale silica gel, which has a blue color. When used the gel absorbs moisture, causing it to turn pink or white. Do not pump air through the dehydrator into a coaxial cable after the dehydrant has changed color, because such air is not thoroughly dried.

To reactivate the gel, pour it into an open pan and bake several hours at 300 to 350 degrees. If preferred, discard the deactivated charge and replace with one pound of telltale silica gel as supplied by Victor J. Andrew Co. When refilling, pour the gel into the space between the pump cylinder and the transparent drier barrel, being careful not to spill any of the crystals into the pump cylinder itself.

Always keep in a cool dry place. Do not expose the transparent drier barrel to temperature greater than 140° F. Do not unnecessarily expose fresh silica gel to a moist atmosphere.

IV. OPERATION OF CONTROL RECEIVER CABINET ASSEMBLY

I. GENERAL.

There are four units mounted in the control receiver cabinet. The speaker panel is factory mounted. The AC ON-OFF switch, which is master control for the entire cabinet assembly, is mounted on this panel at the right of the speaker. In the OFF position, no part of the unit is operative. In the ON position of the switch, the amber pilot at top center of the panel will be illuminated.

2. RECEIVER OPERATION.

The REC SELECTOR switch on the speaker panel controls choice of the receiver it is desired to operate. REC 1 position will connect the antenna and loudspeaker to the upper receiver. In REC 2 position, the upper receiver becomes imperative and the lower receiver comes into use with antenna and speaker connected.

The SENSITIVITY controls on both receivers, have a dial plate designation, AC OFF. Turning the control clockwise will turn on AC power and also control receiver sensitivity.

The green pilot at top center of each receiver panel will light as the receiver is turned on. The control marked VOLUME mounted on the panel of the receiver controls speaker volume.

SQUELCH ON-OFF switch, which is at the center of the receiver panel, controls the squelch circuit which is pre-adjusted by resistor R40 as explained in the Instruction Book for Radio Receptor Company Type 201-A Receiver

3. REMOTE CONTROL OPERATION.

The Remote Control Unit is mounted as the lowest unit. Under the AUDIO LINE LEVEL indicator at the top center of this panel are three switches, which are for remote control of the transmitter. A fourth switch PRESS-TO-TALK, attached to the microphone, forms a part of this unit.

a. AC LINE ON-OFF, is in the line circuit of the Remote Control Unit, controls AC switching of the unit itself.

b. FILAMENT ON-OFF, is a switch for remotely controlling the transmitter filaments.

c. PLATE ON-OFF, is a remote control switch for transmitter plate operation, and is effectively in parallel with the press-to-talk switch.

Note that closing the Plate switch at the remote control unit will light that pilot, but a 35 second delay must ensue after closing the Filament switch before the Plate pilot at the transmitter will light and plate voltage be applied.

4. PRESS-TO-TALK SWITCH.

Press-To-Talk Switch, located on the microphone makes and breaks the transmitter plate circuit so that the transmitter is thereby remote controlled. A relay (E1R) in the Remote Control Unit is actuated by the Press-To-Talk Switch and is wired to cut out the loudspeaker in the control cabinet during transmissions.

The microphone jack is on the right side of the panel. The MODULATION LEVEL Control, which regulates the audio level is at the left of the microphone jack. This is adjusted, while observing the meter reading for AUDIO LINE LEVEL. Gain for modulation is pre-set at the transmitter for proper operation of the circuit. This is accomplished by first setting the MODULATION LEVEL control at the Remote Control position while speaking or whistling into the microphone,

until a reading of about 50% modulation is observed on the meter AUDIO LINE LEVEL, at peaks of modulation. Simultaneously, a setting of MODULATION LEVEL control is made at the transmitter until the percentage of modulation reads 50% at peaks.

For remote control of the transmitter, the AC LINE switch at the transmitter must be at ON position, illuminating the amber pilot lamp. The AC LINE ON-OFF switch on the speaker panel is turned ON in the Remote Control Unit, causing the associated amber pilot to light. The AC LINE ON-OFF switch on the remote control panel is turned ON, illuminating the small amber pilot of the Remote Control Unit. The FILAMENT switch is thrown to ON, lighting the green pilot at the Control panel and the green pilot at the transmitter. After a 35-second interval the Plate switch is thrown to ON, illuminating the red pilot at Remote Control instantly. The red pilot at the transmitter will light as soon as time delay action makes proper contact. The transmitter will then be operative, the carrier on. As the carrier comes on, a "plopping" sound will occur in the receiver, if it is operating and adjusted to the carrier frequency of the transmitter. Turn the Plate switch OFF and control transmissions by means of the Press to Talk switch on the microphone handle.

Reference to the circuit diagram of the Remote Control Unit will show that both the Plate switch and the Press to Talk switch perform the same function, namely: to actuate the plate power circuits in the transmitter. However, the Press to Talk switch operates a relay (E1R) one pair of contacts of which are in parallel with the Plate switch and the other pair of contacts serve to open an external circuit. This circuit is connected to the loudspeaker so as to silence it while transmitting.

It will be seen from the above that is is possible to monitor the presence of carrier output from the transmitter by operating the Plate switch, but as soon as the Press to Talk switch is operated the loud speaker will be cut out. This is necessary to prevent accoustic feed-back.

5. STEP-BY-STEP OPERATION OF REMOTE CONTROL RECEIVER CABINET ASSEMBLY

a. Transmission (Carrier):

(1) At transmitter Throw AC LINE switch to ON.

(2) Throw AC ON-OFF LINE switch on speaker panel to ON.
(3) Throw AC ON-OFF switch on Remote Control Unit to ON.
(4) Throw FILAMENT switch at Remote Control Unit to ON.
(5) Turn receiver SENSITIVITY control past the AC OFF position according to instructions for Radio Receptor Company, 201-A Receiver.
(6) Turn VOLUME control to position according to instructions for Radio Receptor Company, Receiver 201-A.
(7) Plug microphone in MIC. jack.
(8) Throw PLATE ON-OFF switch on Remote Control Panel to ON position.
(9) Listen for transmitter carrier as a check. (Will occur 35-seconds after Filament switch is operated).
(10) Throw Plate switch OFF.
(11) Operate PRESS-TO-TALK switch as speech is desired.

b. Break-in or Stand-by.

Operations 1-7 (inclusive) as directed, remain undisturbed. Remote Control Unit switch, PLATE ON-OFF is in OFF position. Transmitter carrier and modulation are both controlled by PRESS-TO-TALK switch on the microphone.

IV. APPENDIX

1. Parts List

Symbol	Name or Function	Mfr.	Identification
1.	Ant.-Speaker Switch	Wirt	#713
2.	Loud Speaker	Jesnen	PM-6-C(500 ohm)
3.	Pilot Lamp Receptacle	Gothard	#1001 (amber)
3.	Pilot Lamp	Hygrade	S-6
4.	AC Line Switch	P & S	#1311
5.	Speaker Panel Terminal	RRCo.	Type 463-5
-	AC Line Terminals	Burke	#6002

2. List of Manufacturers

Symbol	Name	Address
V.J. Andrews	Victor J. Andrews Co.	363 E. 75th Street Chicago, Illinois
Burke	Burke Electric Co.	12th & Berry Streets Erie, Pa.
Gothard	Gothard Mfg. Co.	1300 North 19th Street Springfield, Ill.
Jensen	Jensen Radio Mfg. Co.	6601 South Laramie Ave. Chicago, Ill.
P & S	Pass & Seymour Inc.	Solvay Station, Syracuse, N. Y.
RRCo.	Radio Receptor Co. Inc.	251 West 19th Street New York City
Wirt	Wirt Co.	5221 Greene Street Philadelphia, Pa.

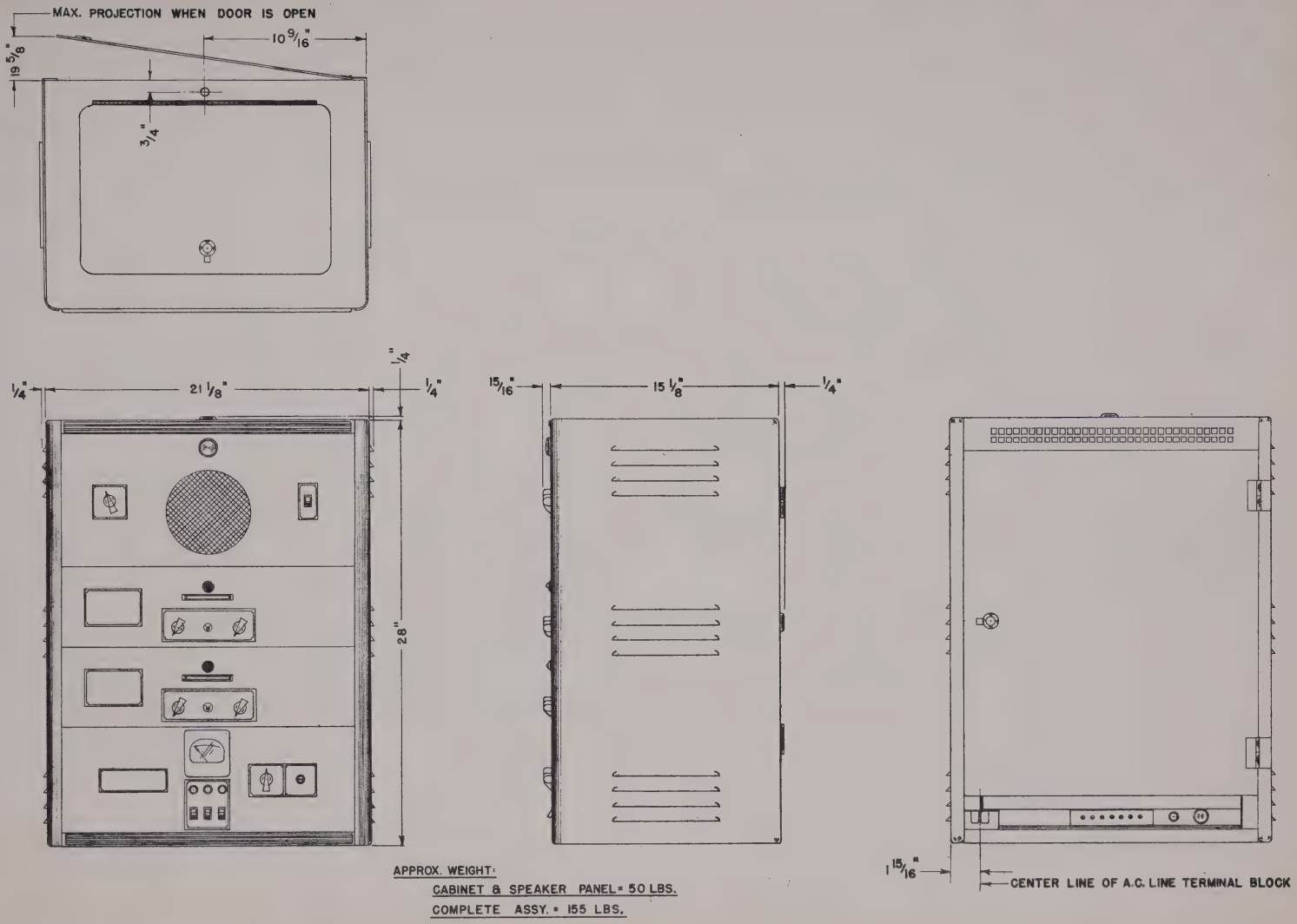


Figure 1 Control Cabinet Assembly, Type 463—Outline Drawing

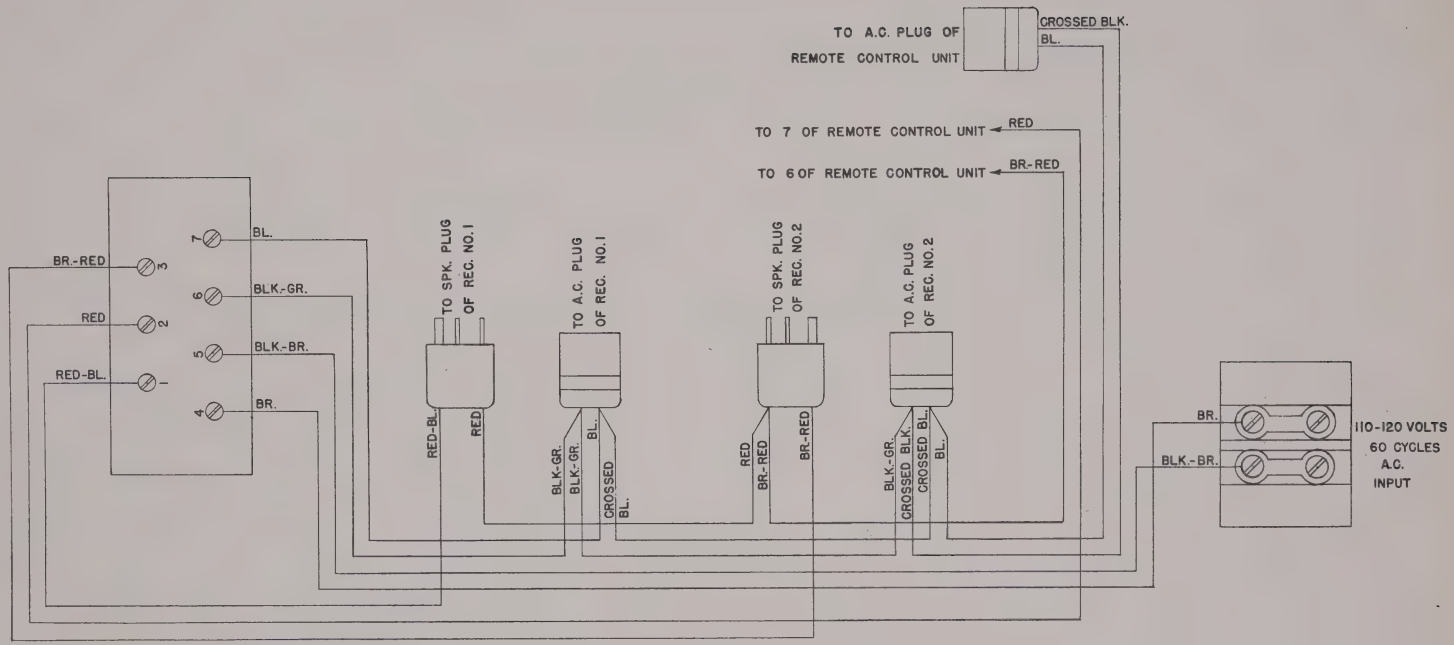


Figure 2 Control Cabinet Assembly, Type 463—Interconnecting Cable Diagram

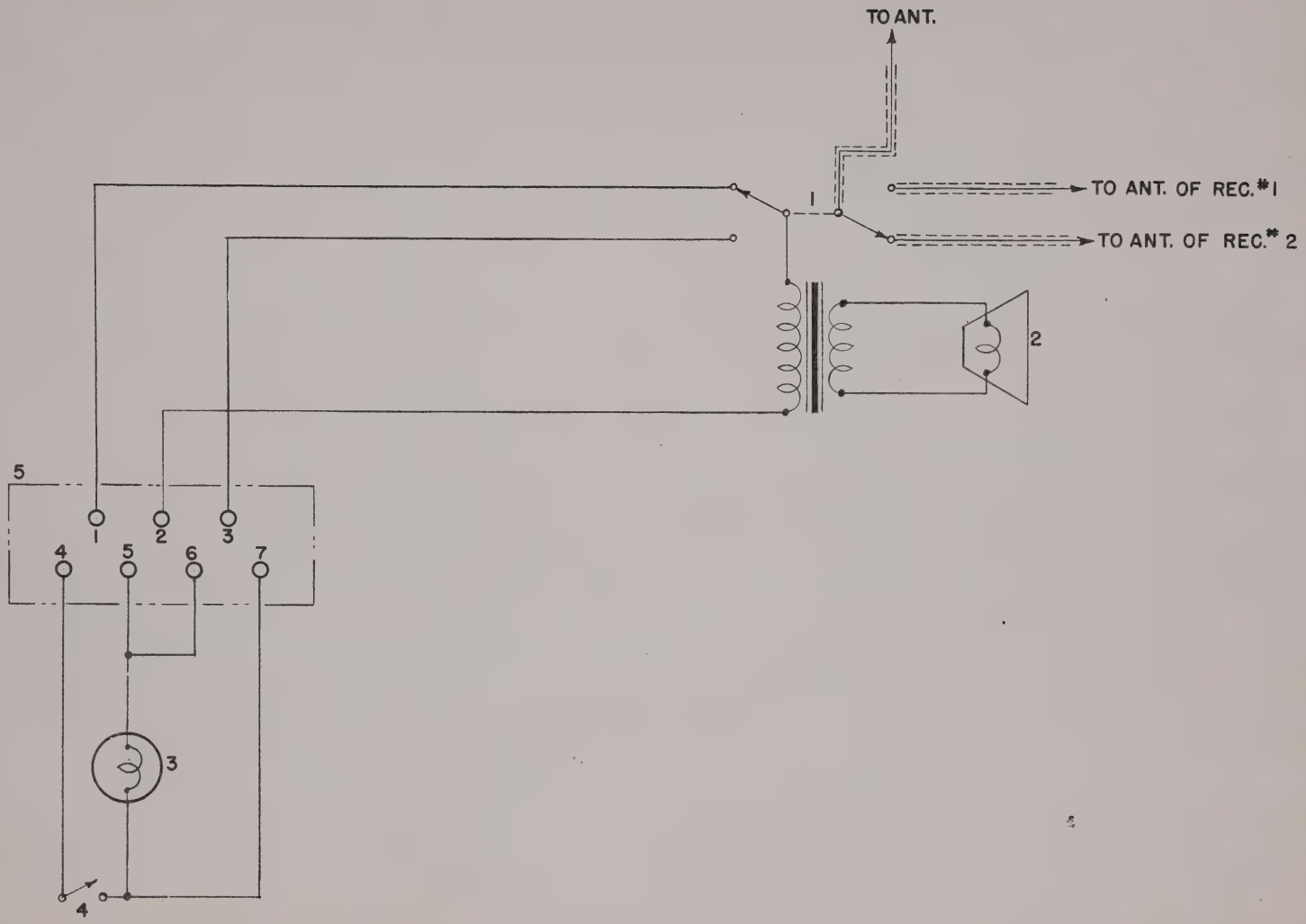
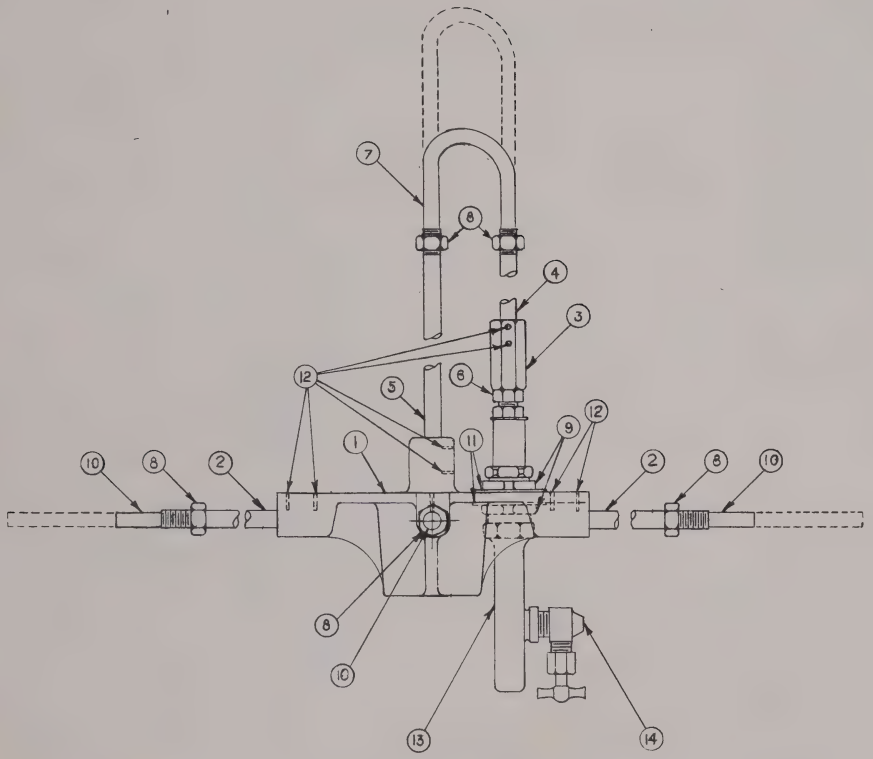
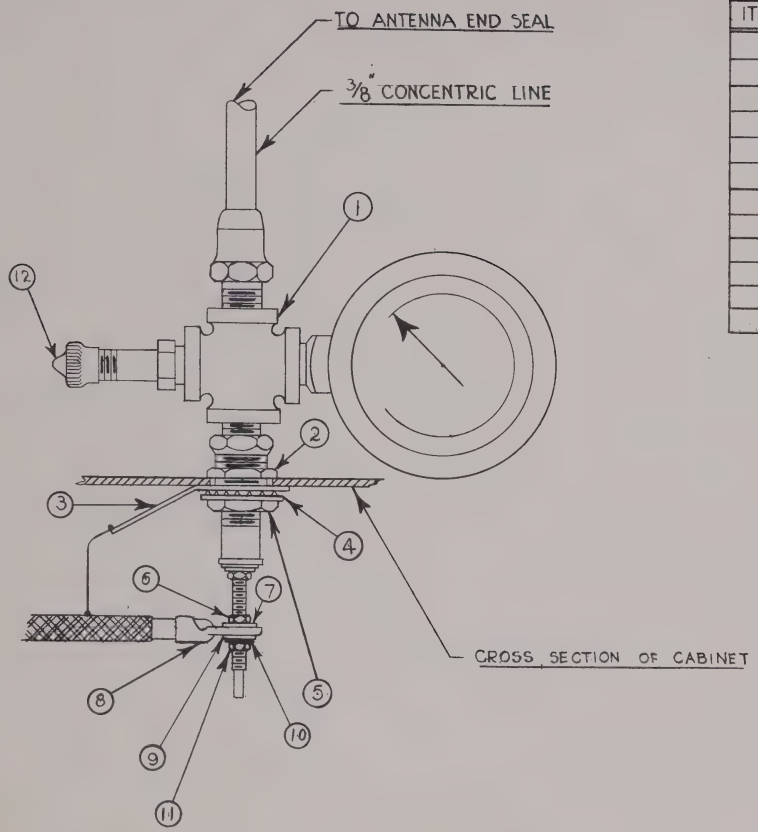


Figure 3 Control Cabinet Assembly, Type 463—Speaker Panel Schematic



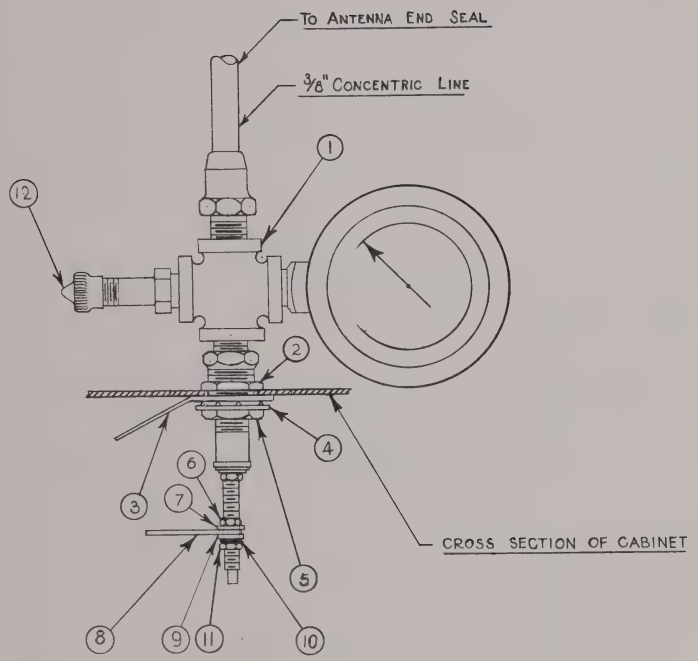
No.	Description	Manuf.
1	Antenna Casting	R. R.
2	Ground Plane Rod	R. R.
3	Radiator Fitting	R. R
4	Short Vertical Element	R. R.
5	Long Vertical Element	R. R.
6	Locking Nut	V. J. Andrew Co.
7	Adjustable Vertical Element	R. R.
8	Nut	R. R.
9	Large Nut	V. J. Andrew Co.
10	Adjustable Horizontal Element	R. R.
11	Washer	V. J. Andrew Co.
12	Set Screw (Allen Head)	
13	Antenna End Seal	V. J. Andrew Co.
14	Release Valve	V. J. Andrew Co.

Figure 4 Antenna, Type 204-B—Mechanical Assembly



ITEM*	DESCRIPTION	COMPANY
1	END SEAL	V. J. ANDREWS CO.
2	TOP MTG. NUT	V.J. ANDREWS CO.
3	GROUND LUG	ZIERICK
4	MTG. LOCKWASHER	
5	BOTTOM MTG. NUT	V.J. ANDREWS CO.
6	TOP NUT	V.J. ANDREWS CO.
7	TOP WASHER	V.J. ANDREWS CO.
8	CABLE LUG	RADIO RECEPTOR
9	BOTTOM WASHER	V.J. ANDREWS CO.
10	LOCKWASHER	V.J. ANDREWS CO.
11	BOTTOM NUT	V.J. ANDREWS CO.
12	AIR INTAKE VALVE	V.J. ANDREWS. CO.

Figure 5 Control Cabinet Antenna System Assembly



ITEM #	DESCRIPTION	COMPANY
1	ENDSEAL	V.J. ANDREWS
2	TOP MTG. NUT	V.J. ANDREWS
3	GROUND LUG	ZIERICK
4	MTG. LOCKWASHER	
5	BOTTOM MTG. NUT	V.J. ANDREWS
6	TOP NUT	V.J. ANDREWS
7	TOP WASHER	V.J. ANDREWS
8	LUG	ZIERICK
9	BOTTOM WASHER	V.J. ANDREWS
10	LOCKWASHER	V.J. ANDREWS
11	BOTTOM NUT	V.J. ANDREWS
12	AIR INTAKE VALVE	V.J. ANDREWS

Figure 6 Transmitter Cabinet Antenna System Assembly

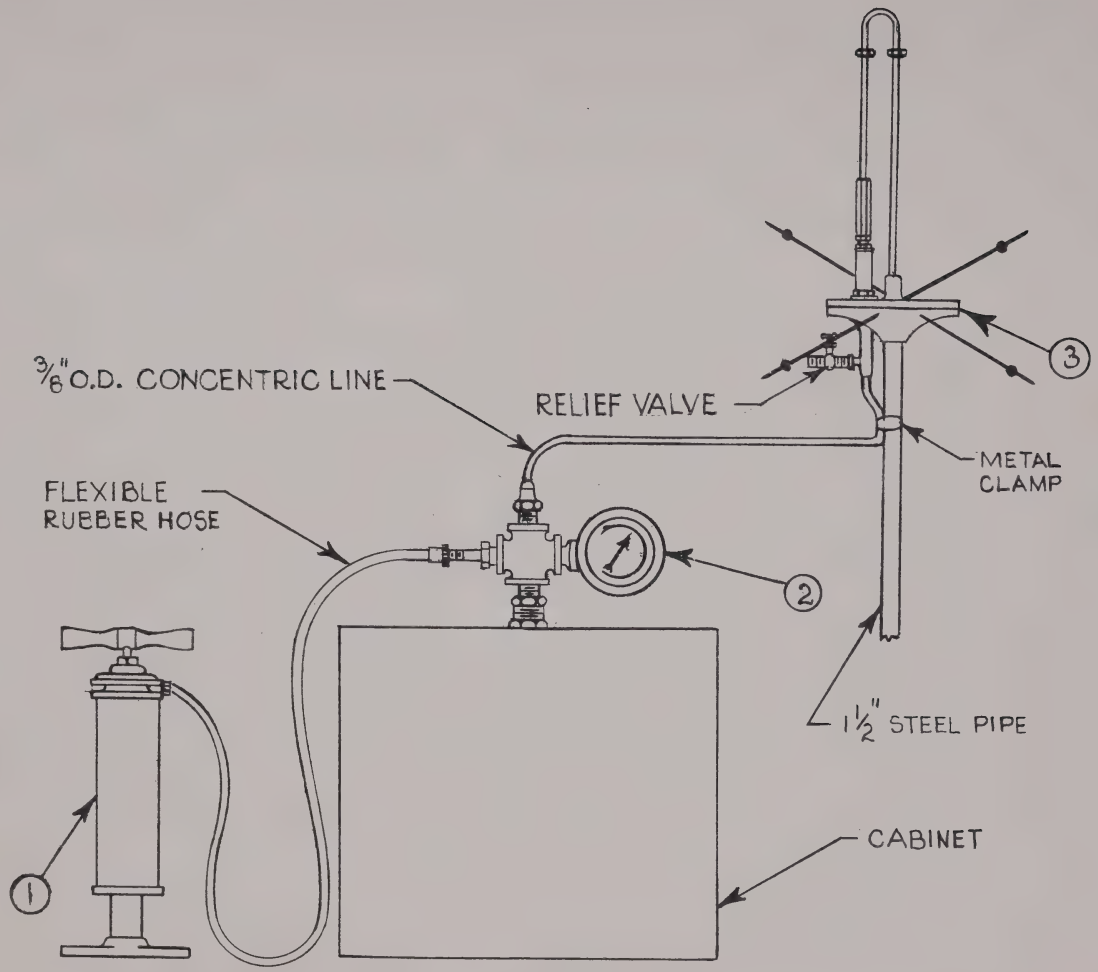


Figure 7 Antenna, Type 204-B—Installation Drawing

PRELIMINARY
INSTRUCTION BOOK

FOR

TYPE 201-A U. H. F.

FIXED FREQUENCY

AIRPORT RECEIVER

MANUFACTURED FOR SIGNAL CORPS, U. S. ARMY

Order No. 2258 - W F - 42

RADIO RECEPTOR CO., INC.
NEW YORK NEW YORK

SAFETY NOTICE

WARNING. THERE ARE VOLTAGES PRESENT IN THIS EQUIPMENT WHICH MAY ENDANGER HUMAN LIFE. DO NOT ATTEMPT TO MAKE REPAIRS OR REMOVE TUBES FROM THIS EQUIPMENT WITHOUT REMOVING THE AC INPUT VOLTAGE OR TURNING THE AC SWITCH TO THE OFF POSITION. ALWAYS USE INSULATED TEST PRODS WHEN MEASURING TUBE SOCKET VOLTAGES.

NOTE: This receiver is shipped from the factory to operate on 126.18 Megacycles.

The operating frequency of this receiver can be changed to 116.1 Megacycles by following the procedure outlined in Section E, Alignment.

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A. DESCRIPTION OF EQUIPMENT

1. BRIEF DESCRIPTION.

The Radio Receptor Type 201-A, UHF Receiver is designed to be operated as a fixed frequency airport communications receiver. It is intended for use in receiving radio-telephone communications from aircraft in the vicinity of an airport. This receiver is designed to be installed in a standard cabinet type relay rack together with a loudspeaker and other associated equipment.

At the back of the receiver there are plug receptacles provided for the AC power input, the antenna input and the audio output. The power input fuse is also located at the back of the receiver.

This receiver employs a conventional super-heterodyne type circuit with an amplified automatic volume control and automatic audio squelch circuit. Amplification of the AVC assures a constant audio output level from the loudspeaker over a wide range of incoming signal intensity, and in the absence of any incoming signal, the audio squelch circuit completely silences the receiver output. The squelch circuit may be rendered inoperative by a switch which is provided on the front panel. Two other controls are located on the front panel; the AC off/on switch combined with the sensitivity control, and the audio volume control. A green pilot light indicates when the receiver is in operation.

2. ELECTRICAL CHARACTERISTICS.

a. Power Input.- 110-120 volts AC, 60 cycles, 80 watts.
b. Power Output. - Maximum 2.5 watts, nominally 1 watt audio output to a 600 ohm line.
c. Frequency Range.- 120 to 145 megacycles with appropriate quartz crystal. For operation on 116.1 megacycles see Section E., Alignment.
d. Intermediate Frequency.- 6.125 megacycles
e. Sensitivity.- 10 microvolts or better
f. Selectivity.- Band-width obtainable is greater than 50 kc. at 2x, less than 140 kc. at 10x and less than 250 kc. at 100x signal inputs.
g. Image Response.- 40 db.
h. Signal to Noise Ratio.- 6 db. or better.
i. Automatic Volume Control.- Output within plus or minus 3 db. with signal inputs from 50 microvolts to 100,000 microvolts.
j. Audio Frequency Response.- Approximately 6 db. down at 100 cycles and 3000 cycles from zero point at 800 to 1000 cycles. 15 db. down at 6000 cycles.

NOTE: For mounting dimensions and weight of the receiver, see Fig. 2 - Outline Drawing.

3. VACUUM TUBE COMPLEMENT

The Radio Receptor Type 201-A UHF Fixed Frequency Airport Receiver employs a total of 12 tubes as follows: (see Fig. 1 - Schematic Wiring Diagram.)

Function	Type	No.
R. F. Amplifier (signal input)	9003 pentode	V12
1st Detector (mixer)	9002 triode	V11
1st I. F. Amplifier	6SG7 pentode	V4
2nd I. F. Amplifier	6SG7 pentode	V3
3rd I. F. Amplifier	6SG7 pentode	V2
2nd Detector	6SQ7 diode	V1
1st Audio Amplifier	6SQ7 triode	V1
Audio Output Amplifier	6V6 GT/G pentode	V6
Audio Squelch	6C8G twin triode	V8
Crystal Oscillator	6C8G twin triode	V8
1st Multiplier (3X)	6C8G twin triode	V9
2nd Multiplier (3X)	6C8G twin triode	V9
3rd Multiplier (2X)	9002 triode	V10
A.V.C. Detector	6SQ7 diode	V7
A.V.C. Amplifier	6SQ7 triode	V7
Power Rectifier	80 diode	V5

The receiver chassis is plainly marked to enable the tubes to be placed in their proper sockets. For tube base connections see Appendix, Fig. 3.

4. ELECTRICAL CIRCUIT DESCRIPTION. (Refer to Appendix Fig. 1.)

The antenna input circuit consists of a resonant circuit C1, L1, with the 70 ohm input link coupled to the inductor, L1. The incoming signal is transferred from L1 to L2 by inductive coupling. L2, C2 is the tuned circuit at the grid of the R. F. amplifier, V12. The grid of the Mixer tube V11, is coupled to the R. F. amplifier by an R. F. transformer with a tuned secondary, L3, C8. The output of the Mixer tube is fed to the I. F. amplifier through a shielded lead to the 1st I. F. transformer.

The I. F. amplifier consists of three type 6SG7 tubes, V2, V3 and V4, and four double-tuned I. F. transformers. Filter resistors and condensers are located inside these transformer shield cans. Audio detection occurs in the diode section of the 6SQ7 type tube, V1. The triode section of this same tube is the 1st audio amplifier and a type 6V6 GT/G, V6, is the audio output amplifier.

One section of the double triode, V8, is the crystal oscillator and the other triode section operates the audio squelch. The crystal frequency is multiplied three times by one section of the double triode, V9, and again three times by the second section of the same tube. V10 is the third multiplier tube which is operated as a doubler. Consequently the tuned circuit L4, C7, is tuned to the 18th harmonic of

the quartz crystal. The coupling between L3 and L4 introduces the heterodyne frequency into the grid of the Mixer tube, V11, along with the amplified signal frequency from the R. F. amplier.

A portion of the output of the I. F. amplifier is coupled to one diode element of V7 where it is rectified and fed to the grid of the triode portion of the same tube through sufficient filter to remove modulation. The cathode of this tube, V7, has a large voltage drop between its cathode and B minus, (B-) caused by the resistor, R44.

The audio output is "Squelched" by the plate current flow in the squelch section of the twin triode, V8. This plate current flows through the resistor R39. The potential difference across this resistor is applied between the grid and cathode of the 1st audio amplifier, V1, with the negative end connected to the grid. This negative voltage on the grid of V1 blocks the tube and silences the receiver. When the plate current in the squelch tube, V8, is reduced by the negative voltage obtained from a received signal, the negative bias is removed from the 1st audio amplifier, V1, and the receiver output is restored.

The plate current in the squelch tube, V8, is reduced by the bias applied to the grid from the current flow through R44.

A strong signal input to the receiver will operate the AVC because the cathode of V7 becomes negative with respect to ground. When this happens, current flows in the AVC diode element which results in a negative voltage at the point where R45 and R46 are tied together. This negative AVC voltage is fed to the grids of the R. F. and I. F. amplifier tubes to reduce the amplification. The triode section of V7 operates as a DC amplifier and produces an AVC voltage much greater than would be obtained from rectification of the I. F. amplifier output alone.

B. INSTRUCTIONS FOR INSTALLATION.

The Type 201-A Receiver is shipped with all the tubes in place except the three miniature glass envelope tubes Type 9003 and 9002 (V10, V11 and V12). These small tubes and the quartz crystal are separately packed in small cardboard boxes under the removable dust cover at the back of the receiver. Also packed under the dust cover is a small five inch length of black fiber tube with a hexagonal internal bore. This tool is supplied for use in aligning the R. F. trimming condensers. The long tongs are designed to make it possible to remove the metal tubes for testing or replacement without disturbing the receiver in its rack mounting.

Remove all packing material under the dust cover and carefully unpack the small glass tubes and the crystal. Refer to Appendix Fig. 4 for the location of these parts. Be sure all the tubes are fully seated in their sockets and metal tube shields are firmly in place. Carefully check to be sure no parts have become loose or damaged in shipment.

The receiver is now ready to be mounted in the cabinet with loudspeaker and the transmitter control unit. Install four machine screws and the trim washers in the slots at the edges of the panel. The AC power input, audio output and antenna input plugs are already wired ready for connection to the receiver. First, the antenna input plug should be inserted and the locking ring tightened. Then the dust cover should be fastened in place. Check the fuse by pushing in on the receptacle and then giving it a slight twist to remove the cap with the fuse. The AC power input and the audio output plugs may now be inserted through the holes in the dust cover.

C. ADJUSTMENT AND OPERATION

1. ADJUSTMENT

This receiver has been carefully aligned at the factory and checked for proper performance. The operating frequency is indicated on the front panel. No attempts at alignment of this receiver should be made unless it is absolutely necessary.

The power transformer (T5) has a tapped primary winding with taps marked 110 and 120 volts. The AC input should normally be wired to the 110 volt tap. The 120 volt tap should be used only for line voltages in excess of 120 volts.

The control R40 as marked on the chassis is a screwdriver adjustment which permits the squelch level to be set to operate at any desired level of signal input or to compensate for changing tube characteristics with age. When this control is in the extreme counterclockwise position the squelch is inoperative. Clockwise rotation increases the signal level required to operate the squelch.

With the front panel squelch switch in the ON position, the sensitivity control must be set in the extreme clockwise position for maximum sensitivity. The normal adjustment of the squelch control, R40, should be such that with the sensitivity control set at maximum, the receiver is completely quiet. R40 should be rotated in a clockwise direction just far enough to produce this result. If this control is rotated too far in the clockwise direction the receiver sensitivity will be needlessly reduced. If a high noise level persistently opens the squelch to cause disagreeable audio output, slightly retarding the front panel sensitivity control will silence the receiver for this noise but will still permit incoming signals to operate the squelch and be audible at the loudspeaker.

2. OPERATION

The AC power switch is OFF when the sensitivity control is in the extreme counter-clockwise position. When this control is rotated in a clockwise direction the AC power is turned ON and the sensitivity is advanced. The green pilot light will glow to indicate that the receiver is operating.

With the squelch switch in the ON position the sensitivity should be set in the extreme clockwise position for maximum sensitivity. Turning the squelch switch to OFF automatically disconnects the sensitivity control and leaves the receiver at maximum sensitivity. A weak signal which fades in and out and cannot be received satisfactorily with the squelch switch in the ON position will usually be readable with the squelch switch set to OFF.

The audio volume control need not be adjusted after the audio level has been once set to a comfortable volume.

D. MAINTENANCE AND REPAIR

1. ROUTINE MAINTENANCE

Regular periodic maintenance procedure will greatly decrease the possiblity of failure of this receiver. Such procedure should include cleaning all dust and dirt from exposed parts of the chassis and the tubes. The antenna input, the power input and the audio output plugs should be kept free from corrosion. This also applies to the fuse. Loose connections and frayed or worn leads should be repaired. The top and bottom covers and the dust cover should be securely fastened.

Vacuum tubes need to be tested rarely, if ever, as long as operation continues to be satisfactory. The tube extracting tongs are supplied to facilitate the removal and insertion of metal tubes when necessary. A little time spent in experimentation will soon disclose the best method of using this tool. It is designed to grasp the tube under its base with the jaws closing between the tube base and the socket.

NOTE: The AC power switch must be OFF before attempting to remove or replace tubes with this tool.

2. REPAIR.

In order to carry out any extensive repairs or alignment procedure the receiver must be removed from its rack mounting and the top and bottom shields removed. This will expose the complete chassis except for the interior of the R. F. portion of the receiver. The R. F. unit may be unbolted and the connecting plugs removed if it is necessary to remove the side shield of this unit. For testing purposes, this unit may be operated with this side cover removed.

The electrolytic condensers are plug-in type to facilitate quick replacement of a defective unit.

E. ALIGNMENT

APPENDIX contains, in Section 3, a Table of Tube Socket Voltages; Section 4, Fig. 1 - Schematic Wiring Diagram and Fig. 3 - Tube Base Connection Diagram. Reference to this data will provide information necessary to locate circuit faults which may develop.

No attempts at alignment of the Intermediate Frequency amplifier should be made unless it is absolutely necessary. Sufficient information is contained in the following pages to insure a successful outcome but this must not be understood to be a recommendation of this procedure as part of routine maintenance.

To alter the operating frequency of this receiver it is not necessary to re-align the I. F. Amplifier. Only the Crystal Oscillator, the Multiplier circuits and the R. F. circuits will need to be retuned.

As shipped from the factory the Radio Receptor Type 201-A UHF Receiver is adjusted to operate on 126.18 Megacycles unless otherwise indicated on the front panel. The crystal frequency is 6669.72 kilocycles for this operating frequency. The frequency range as indicated on the nameplate (120 to 145 Mc.) may be extended to higher or lower frequencies but the best performance will not always be obtained without some modifications in the R. F. circuits.

Satisfactory performance at 116.1 megacycles may be obtained by inserting a new crystal ground to 6790.27 kilocycles which is mounted in a Bliley AR4W crystal holder or an FT-249 crystal holder with crystal in position "A". The frequency multiplication is 18 times which results in a heterodyne frequency of 122.225 megacycles. The I. F. amplifier is always tuned to 6.125 Mc. This is the difference frequency between 116.1 and 122.225 Mc. (or 126.18 and 120.055)

No difficulty should be experienced in tuning the oscillator and multiplier circuits if the following procedure is carried out.

1. Crystal Oscillator and 1st Multiplier Alignment

In the absence of a received signal, correct adjustment of the iron core trimmers which tune the crystal oscillator and multiplier circuits (L7, L6 and L5, See Appendix, Fig. 1- Schematic Wiring Diagram.) may be accomplished with the aid of a DC Voltmeter (1000 ohms per volt or higher).

With the voltmeter set to the 50 volt scale, connect the positive (+) lead to pin #4 at the base of the 6C8G tube V9, connect the negative (-) lead to B- (not chassis or ground) which will be found at the bottom of the voltage divider resistors (R48, R49, R50 & R51). These resistors are mounted in a bracket between the pilot light and the filter choke (CH1) on the front panel. The two wires with blue and black tracers connect to the B-end of this divider.

Correct adjustment of the iron core which tunes the crystal oscillator will be indicated by the point where the voltmeter reading is the highest. This will be approximately 20 volts.

To tune the 1st multiplier the positive (+) voltmeter lead must be moved to pin #8 at the base of the 6C8G tube V9. The negative voltmeter lead should remain connected to B-.

Correct adjustment of the iron core which tunes the 1st Multiplier will be found where the adjusting nut protrudes to approximately the same height as the nut on the oscillator tuning adjustment and the voltmeter reading is again a maximum. This voltage will also be approximately 20 volts.

Before removing the voltmeter, remove the crystal from its socket and note the voltmeter reading. If the voltage drops to about 10 volts and then returns to about 20 volts when the crystal is replaced, everything is operating properly.

2. R. F. Circuit Alignment

The following equipment and tools will be required to do alignment work on the R. F. circuits of this receiver.

FIBER TUNING TOOL (supplied with the receiver)
UHF SIGNAL GENERATOR (output modulated approximately 30% at 400 cycles -- attenuation from 100,000 microvolts to 5 microvolts or less)
OUTPUT METER (600 ohms impedance or an AC voltmeter, 1000 ohms per volt or higher - 0 to 25 volt scale.)
HEADPHONES (2000 ohms impedance or higher)

Connect the signal generator to the Antenna Input.

Connect the output meter to the Audio Output or the AC voltmeter to the audio output with the loudspeaker in place. (A 600 ohm resistor, ½ or 1 watt size, can be substituted for the loudspeaker.)

Align the Crystal oscillator and 1st Multiplier circuits if this has not been done.

Turn the receiver sensitivity and audio volume controls to maximum (extreme clockwise position) and set the squelch switch to OFF.

Tune the signal generator to the desired operating frequency (126.18 or 116.1 MC.).

Temporarily connect the headphones across the output meter.

Increase the output from the signal generator in small steps and tune through the operating frequency listening in the headphones for a signal.

When a weak signal is heard in the headphones, the tuning adjustments for the 2nd and 3rd multiplier should be tuned for the greatest receiver sensitivity.

The Antenna, R. F. and Mixer circuits should also be tuned for greatest receiver sensitivity.

In no case should the signal input from the Signal Generator be more than is required to produce an audio output greater than ½ watt or 17½ volts AC across the loudspeaker or the 600 ohm resistor. This precaution is necessary because the AVC will hold the audio output constant for any stronger signal input.

If no signal can be heard in the headphones with 100,000 microvolts or more signal input from the signal generator, it will be necessary to resort to tuning each of the trimmers and adjustments in very small steps until a response is located. This situation will only occur when the operating frequency is considerably removed from the newly desired operating frequency.

The trimmers in the R. F. circuits are marked with red paint in such a way that when the dots are in line with each other, the trimmers are set to maximum capacity. With this in mind it is easy to determine in which direction these trimmers must be rotated if it is remembered that maximum capacity corresponds to the lowest frequency.

When the trimmers are set at approximately half capacity the R. F. circuits will be near 126.18 Mc. To tune to 116.1 Mc. the capacity increase will correspond to about 10 deg. of rotation.

The iron core trimmer for the 2nd Multiplier circuit should be rotated in a counterclockwise direction about 3/4 turn when changing from 126.18 to 116.1 Megacycles. The Mixer trimmer will need to be set for a higher frequency (lower capacity) when changing operating frequency from 126.18 Mc. to 116.1 Mc.

If two positions are found for the iron core trimmer which is marked on the chassis "3rd Mult. Grid", the correct position is the one which results in the best receiver sensitivity. In any case, the receiver sensitivity will not be normal if this trimmer is tuned to the wrong harmonic.

It will be necessary to continually re-tune the signal generator as the output is reduced and the receiver sensitivity is improved as the alignment progresses. Repeated adjustments of the Antenna and R. F. trimmers will be necessary to attain the best receiver performance.

NOTE: The iron core trimmer which is marked on the chassis, "3rd MULT. GRID" is actually in the coil L5 in the plate circuit of the 2nd multiplier plate circuit, to which the 3rd multiplier grid is coupled.

3. Intermediate Frequency Amplifier Alignment. (see Appendix Fig. 4.)

The quickest and best method for alignment of the I. F. Amplifier is with a Sweep-Frequency Generator and an Oscilloscope. If this equipment is available, reference to the instuctions for operating it in addition to the information given here will be sufficient to assure good results.

An output meter as described under 2. R. F. Circuit Alignment will be needed. A ¼" hex. "Spintite" type wrench should be used to adjust the nuts on the ends of the iron core trimmers.

The Signal Generator with output modulated should be tuned to 6125 Kilocycles. (± 5 Kc.)

Turn the AC power input to the receiver OFF.

Remove the plug marked "Output" between the two type 9002 tubes, V10 and V11. WARNING: The full high Voltage DC appears at this point. Do not permit the plug tip to become short circuited to the chassis at any time.

Connect the output of the Signal Generator to the tip of this plug through a blocking condenser, either mica or paper condenser which is rated for at least 400 volts DC. Any convenient value of condenser will be satisfactory. Two twisted insulated wires can be used if a condenser is not available. Only 6 or 8 inches of wire will be needed.

Ground the Signal Generator to the receiver chassis or to the shield braid at the plug.

NO MORE SIGNAL INPUT SHOULD BE USED THAN IS SUFFICIENT TO PRODUCE ½ WATT AUDIO OUTPUT.

If audio output is indicated on the output meter, first tune both the PLATE and GRID iron core trimmers on the 2nd and 3rd I. F. transformers for maximum audio output.

Reduce the signal input if the output meter reading exceeds ½ watt or 17½ volts AC across the loudspeaker or 600 ohm resistor.

Do not attempt to tune the PLATE trimmer on the 1st I.F. transformer. This trimmer must be adjusted only when the plug has been restored to the socket between V10 and V11.

The GRID trimmer on the 1st I. F. transformer may be tuned for maximum audio output.

Incorrect alignment of the DIODE trimmer on the 4th I.F. transformer will produce a very narrow pass band and possibly cause regeneration. This condition will occur when the iron core trimmer is turned too far in a clockwise direction to increase the inductance of this circuit. An unsymmetrical

pass band will be produced if this trimmer is turned too far in the counterclockwise direction.

Tuning the Signal Generator through the pass band and carefully observing the output meter will quickly disclose the presence of sharp resonance peaks which result from mis-alignment. The Sweep-Frequency Generator and Oscilloscope are very useful for this observation.

Adjustment of the PLATE trimmer of the 4th I. F. transformer will affect the adjustment of the DIODE trimmer. Consequently, any adjustment of one must be compensated for by adjustment of the other.

When all the trimming adjustments, except the Plate of the 1st I. F. transformer, have been set for best performance, the receiver should be turned OFF, the Signal Generator disconnected and the I. F. input plug restored to the R. F. output. The PLATE trimmer of the 1st I. F. transformer must be adjusted with a signal input to the receiver at the operating frequency.

If a Sweep-Frequency Generator and Oscilloscope is being used, this should be set up to observe the overall receiver response. The response observed with a Sweep-Frequency fed to the antenna input will more truly indicate the performance of the Receiver than the observation of the response with Sweep-Frequency input to the I.F. amplifier alone.

There is enough tuning range in the I. F. amplifier circuits to permit an alteration of the Intermediate Frequency by 500 Kilocycles or more both above and below 6125 Kilocycles. This alteration is not recommended but it is mentioned because often only slight changes in operating frequency can be accomplished in this manner without resorting to changing the quartz crystal.

When the I. F. Amplifier has been correctly aligned, the band-width should be greater than 50 Kilocycles with 2 times signal input. This can be observed by first determining how much signal input at 6125 KC. is required for $\frac{1}{2}$ watt audio output. With the Signal Generator de-tuned, the signal input is increased by 2 times and then the two frequencies noted at which the audio output is just $\frac{1}{2}$ watt. The difference between these frequencies should be 50 KC. or more.

It is possible to obtain a greater band-width but the sensitivity of the receiver will be altered. There is a coupling adjustment at the base of each of the I. F. transformers which appears as a $\frac{1}{4}$" nut. Clockwise rotation of this nut will increase coupling and counterclockwise rotation of this nut will decrease coupling. No adjustment of the coupling is recommended since this has been set at the factory for satisfactory performance. However, if an unusual condition should arise which requires alteration of the band-width, this adjustment can be made.

E. APPENDIX

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
R1	R.F. Amp. AVC. Filter	100,000 ohms, ±20%	ST	½ watt	
R2	R.F. Amp. Cathode Bias	300 ohms, ±10%	ST	½ watt	
R3	R.F. Amp. Screen Filter	3000 ohms, ±20%	ST	½ watt	
R4	R.F. Amp. Plate Filter	2000 ohms, ±20%	ST	½ watt	
R5	Mixer Cathode Bias	10,000 ohms, ±20%	ST	½ watt	
R6	I.F. Input Filter	10 ohms, ±20%	ST	½ watt	
R7	3rd. Mult. Plate Filter	2,000 ohms, ±20%	ST	½ watt	
R8	3rd. Mult. Cathode Bias	3,000 ohms, ±20%	ST	½ watt	
R9	3rd. Mult. Grid.	30,000 ohms, ±20%	ST	½ watt	
R10	2nd Mult. Plate Filter	20,000 ohms, ±20%	ST	½ watt	
R11	Mixer Plate Filter	2,000 ohms, ±20%	ST	½ watt	
R12	1st. I.F. AVC. Filter	100,000 ohms, ±20%	ST	½ watt	
R13	1st. I. F. Cathode Bias	300 ohms, ±10%	ST	½ watt	
R14	1st. I. F. Screen Filter	3,000 ohms, ±20%	ST	½ watt	
R15	1st I. F. Plate Filter	2,000 ohms, ±20%	ST	½ watt	
R16	2nd. I. F. AVC. Filter	100,000 ohms, ±20%	ST	½ watt	

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
R17	2nd I.F. Cathode Bias	300 ohms, ±10%	ST	½ watt	
R18	2nd I.F. Screen Filter	3,000 ohms, ±20%	ST	½ watt	
R19	2nd I.F. Plate Filter	2,000 ohms, ±20%	ST	½ watt	
R20	3rd. I.F. AVC. Filter	100,000 ohms, ±20%	ST	½ watt	
R21	3rd I.F. Cathode Bias	300 ohms, ±10%	ST	½ watt	
R22	3rd I.F. Screen Filter	3,000 ohms, ±20%	ST	½ watt	
R23	3rd I.F. Plate Filter	2,000 ohms, ±20%	ST	½ watt	
R24	I.F. Output Filter	20,000 ohms, ±20%	ST	½ watt	
R25	Audio Volume Control	100,000 ohms "Z" taper	CL	Type 37	
R26	1st Audio Amp. Grid	1 megohm ±20%	ST	½ watt	
R27	1st Audio Amp. Plate	500,000 ohms, ±20%	ST	½ watt	
R28	2nd Audio Amp. Grid	500,000 ohms, ±20%	ST	½ watt	
R29	2nd Audio Amp. Cathode	600 ohms, ±10%	ST	½ watt	
R30	1st Mult. Plate Filter	20,000 ohms, ±20%	ST	½ watt	
R31	2nd Mult. Grid	30,000 ohms, ±20%	ST	½ watt	
R32	2nd Mult. Cathode	10,000 ohms, ±20%	ST	½ watt	
R33	1st. Mult. Cathode	10,000 ohms, ±20%	ST	½ watt	
R34	1st. Mult. Grid	30,000 ohms, ±20%	ST	½ watt	
R35	Osc. Plate Filter	20,000 ohms, ±20%	ST	½ watt	

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
R36	Crystal Osc. Grid.	100,000 ohms, ±20%	ST	½ watt	
R37	Crystal Osc. Cathode	10,000 ohms, ±20%	ST	½ watt	
R38	Squelch Plate	20,000 ohms, ±20%	ST	½ watt	
R39	Squelch Plate	50,000 ohms, ±20%	ST	½ watt	
R40	Squelch Control	50,000 ohms, "S" taper	CL	Type 37	
R41	Squelch Grid	2 megohms, ±20%	ST	½ watt	
R42	Squelch Diode	500,000 ohms, ±20%	ST	½ watt	
R43	AVC. Amp.. Grid	500,000 ohms, ±20%	ST	½ watt	
R44	AVC. Amp. Cathode	500,000 ohms, ±10%	ST	½ watt	
R45	AVC. Filter	100,000 ohms, ±20%	ST	½ watt	
R46	AVC. Diode	500,000 ohms, ±20%	ST	½ watt	
R47	AVC. Amp. Plate Filter	2,000 ohms, ±20%	ST	½ watt	
R48	Voltage Divider	4,000 ohms, 10 watt	LE	Type 1-3/4-E	
R49	Voltage Divider	1500 ohms, 10 watt	LE	Type 1-3/4-E	
R50	Voltage Divider	3,000 ohms, 10 watt	LE	Type 1-3/4-E	
R51	Voltage Divider	1500 ohms, 10 watt	LE	Type 1-3/4-E	
R52	Sensitivity Control	1000 ohms, Taper 6C with SPST switch	ST	Type CD	

NOTE: Some of the first production of receivers have IRC 1/2 watt resistors instead of ST 1/2 watt resistors and AT 10 watt resistors instead of LE 10 watt resistors.

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
C1	Antenna Tuning	25 uuf. variable air	RCCo		
C2	R.F. Amp. Tuning	25 uuf. variable air	RCCo		
C3	R.F. Grid Return	500 uuf. silver mica	SO	MOSW.5-35-20	
C4	R.F. Cathode Bypass	500 uuf. silver mica	SO	MOSW.5-35-20	
C5	R.F. Screen Bypass	500 uuf. silver mica	SO	MOSW.5-35-20	
C6	R.F. Plate Return	500 uuf. silver mica	SO	MOSW.5-35-20	
C7	3rd. Mult. Tuning	25 uuf. variable air	RCCo		
C8	Mixer Tuning	25 uuf. variable air	RCCo		
C9	Mixer Cathode Bypass	500 uuf. silver mica	SO	MOSW.5-35-20	
C10	I.F. Input Filter	5 uuf. silver mica	SO	MOSW.5-55-20	
C11	3rd Mult. Plate Return	500 uuf. silver mica	SO	MOSW.5-35-20	
C12	3rd Mult. Fila. Bypass	.1 uf. paper 200 v.	SO	S-0235	
C13	3rd Mult. Cathode Bypass	500 uuf. silver mica	SO	MOSW.5-35-20	
C14	3rd. Mult. Coupling	500 uuf. silver mica	SO	MOSW.5-35-20	
C15	2nd Mult. Plate Return	500 uuf. silver mica	SO	MOSW.5-35-20	
C16	I.F. Amp. Input Tuning	80-100 uuf. silver mica	SO	MOSW.5-31-10	
C17	I.F. Amp. Grid Tuning	100-120 uuf. silver mica	SO	MOSW.5-31-10	
C18	Mixer Plate Bypass	.005 uf. mica	SO	MWBW.5-25-20	

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
C19	1st I.F. Grid Return	.005 uf. mica	SO	MWBW.5-25-20	
C20	1st I.F. Cathode Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C21	1st I.F. Screen Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C22	1st I.F. Amp. Plate Tuning	80-100 uuf. silver mica	SO	MOSW.5-31-10	
C23	I.F. Amp. Grid Tuning	100-120 uuf. silver mica	SO	MOSW.5-31-10	
C24	1st I.F. Plate Return	.005 uf. mica	SO	MWBW.5-25-20	
C25	2nd I.F. Grid Return	.005 uf. mica	SO	MWBW.5-25-20	
C26	2nd I.F. Cathode Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C27	2nd I.F. Screen Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C28	I.F. Amp. Grid Tuning	80-100 uuf. silver mica	SO	MOSW.5-31-10	
C29	I.F. Amp. Plate Tuning	100-120 uuf. silver mica	SO	MOSW.5-31-10	
C30	2nd I.F. Plate Return	.005 uf. mica	SO	MWBW.5-25-20	
C31	3rd. I.F. Grid Return	.005 uf. mica	SO	MWBW.5-25-20	
C32	3rd I.F. Cathode Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C33	3rd I.F. Screen Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C34	3rd I.F. Amp. Plate Tuning	80-100 uuf. silver mica	SO	MOSW.5-31-10	
C35	4th I.F. Amp. Diode Tuning	100-120 uuf. silver mica	SO	MOSW.5-31-10	
C36	3rd I.F. Plate Return	.005 uf. mica	SO	MWBW.5-25-20	
C37	I. F. Amp. Output Filter	50 uuf. silver mica	SO	MOSW.5-45-20	

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
C38	I.F. Amp. Output Filter	100-120 uuf. silver mica	SO	MOSW.5-31-20	
C39	1st Audio Amp. Coupling	.02 uf. paper 400 v.	SO	S-0223	
C40	1st Audio Cathode Bypass	10 uf.-250 v. electrolytic	SO	SJ181	C40, C44 & C54 are in the same plug-in can
C41	Screen Bypass	.1 uf. paper 200 v.	SO	S-0235	
C42	R.F. Bypass	100-120 uuf. silver mica	SO	MOSW.5-31-10	
C43	2nd Audio Amp. Coupling	.01 uf. paper 400 v.	SO	S-01	
C44	2nd Audio Amp. Cathode	25 uf-25 v. electrolytic	SO	SJ 181	
C45	1st Mult. Plate Return	500 uuf. silver mica	SO	MOSW.5-35-20	
C46	2nd Mult. Grid Coupling	500 uuf. silver mica	SO	MOSW.5-35-20	
C47	2nd Mult. Cathode	500 uuf. silver mica	SO	MOSW.5-35-20	
C48	Mult. Filament Bypass	.1 uf. paper 200 v.	SO	S-0235	
C49	1st. Mult. Cathode	500 uuf. silver mica	SO	MOSW.5-35-20	
C50	1st. Mult. Coupling	500 uuf. silver mica	SO	MOSW.5-35-20	
C51	Osc. Grid Return	500 uuf. silver mica	SO	MOSW.5-35-20	
C52	Osc. Plate Tuning	95±5 uuf. silver mica	SO	MOSW.5-31-10	
C53	Crystal Osc. Cathode	.500 uuf. mica	SO	MWBW.5-25-20	
C54	Squelch Cathode Bypass	10 uf-250 v. electrolytic	SO	SJ 181	
C55	AVC Amp. Cathode Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C56	AVC Amp. Grid Bypass	.005 uf. mica	SO	MWBW.5-25-20	

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
C57	AVC Amp. Plate Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C58	AVC Diode Coupling	50 uuf. mica	SO	MOSW.5-45-20	
C59	Common Neg. Bypass	.1 uf. paper 200 v.	SO	S-0235	
C60	Common B+ Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C61	Common Cathode Bypass	.25 uf. paper 400 v.	SO	DCW	
C62	Common AVC Bypass	.005 uf. mica	SO	MWBW.5-25-20	
C63	Input Filter	20 uf. 450 v. Electrolytic	SO	SJ 182	C63 and C64 are in the same plug-in can
C64	Output Filter	20 uf. 400 v. Electrolytic	SO	SJ 182	
T1	1st I.F. Transformer	R.R. Dwg. #C-242-23	RRCo.		
T2	2nd I.F. Transformer	R.R. Dwg. #C-242-24	RRCo.		
T3	3rd I.F. Transformer	R.R. Dwg. #C-242-24	RRCo.		
T4	4th I. F. Transformer	R.R. Dwg. #C-242-25	RRCo.		
T5	Power Transformer	Primary: 110/120 volts, 60 cycles AC Sec.#1: 6.3 volts @3.8 amps; Sec.#2 5.0 volts @ 2.0 amps; Sec.#3: 600 volts, CT @ 125 amps. DC (1600 v. insulation)	SU	Type PC-110	

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
T6	Output Transformer	Primary: 6000 ohms @40 ma. DC Sec.: 600 ohms, center tapped.	SU	Type FT-111	
CH1	Filter Choke	15 henries @ 125 amp.DC	SU	Type RC-72	
SW1	AC Power	SPST (with R-52)	ST		
SW2	Squelch ON/OFF	DPST Toggle	AH&H	20902Z	
L1	Antenna Tuning Coil		RRCo.		
L2	1st R.F. Tuning Coil		RRCo.		
L3	Mixer Tuning Coil		RRCo.		
L4	3rd Mult. Coil		RRCo.		
L5	2nd Mult. Coil		RRCo.		
L6	1st Mult. Coil	RR Dwg. #C-242-20	RRCo.		
L7	Crystal Osc. Coil	RR Dwg. #C-242-20	RRCo.		
V1	Detector	Type 6SQ7	RCA		
V2	3rd I. F.	Type 6SG7	RCA		
V3	2nd I. F.	Type 6SG7	RCA		
V4	1st I. F.	Type 6SG7	RCA		
V5	Rectifier	Type 80	RCA		

Symbol	Name or Function	Description	Mfr.	Ident.	Notes
V6	Audio Output	Type 6V6	RCA		
V7	AVC Amplifier	Type 6SQ7	RCA		
V8	Crystal Osc. & Audio Squelch	Type 6C8G	RCA		
V9	1st & 2nd Mult.	Type 6C8G	RCA		
V10	3rd. Multiplier	Type 9002	RCA		
V11	Mixer	Type 9002	RCA		
V12	R. R.	Type 9003	RCA		
X1	Quartz Crystal	6669.72 Kc.	BL	AR4W holder	
F1	AC Input Fuse	1-1/2 amp.	BU	Type 4-AG	
P1	Pilot Lamp	6.3 v. Bayonet Base	SYL		

2. MANUFACTUERS NAMES AND ADDRESSES

Symbol	Name	Address
AH&H	Arrow, Hart & Hegeman	155 E. 44th Street New York City
AT	Atlas Resistor Co.	423 Broome Street, NewYork City
BL	Bliley Electric Co.	Union Station Bldg. Erie, Pa.
BU	Bussman Mfg. Co.	53 Park Place, New York City
CL	Clarostat Mfg. Co.	285 N. 6th Street Brooklyn, N. Y.
HBJ	Howard B. Jones Co.	2300 Wabansia Avenue Chicago, Illinois
HH	Harvey Hubbell, Inc.	11 Park Place New York City
IRC	International Resistance Corp.	401 N. Broad Street Philadelphia, Pa.
LE	Lectrohm, Inc.	5133 W. 25th Place Cicero, Illinois
RCCo.	Radio Condenser Co.	Camden, New Jersey
RRCo.	Radio Receptor Co. Inc.	251 West 19th Street New York City
RCA	Radio Corp.of America	Harrison, New Jersey
SO	Solar Mfg. Co.	Bayonne, New Jersey
ST	Stackpole Resistor Co.	254 West 34th Street New York City
SU	Super Electric Prod. Co.	1057 Summit Avenue Jersey City, New Jersey
SYL	Hygrade-Sylvania Corp.	Emporium, Pa.

3. TABLE OF TUBE SOCKET VOLTAGES

All measurements made with Signal Corps Test Set I-56-A, Selective Analyser Weston Model 665 Type 2. All voltages are measured to ground unless otherwise indicated. (115 volts, 60 cycle AC input.)

No.	Type	Function	From	To	Scale Used
V1	6SQ7	1st Audio Amp.	PL 65		250
			K 85		250
			Fil 6.2		10
V2	6SG7	3rd I.F. Amp.	PL 200		250
			SC 80		250
			K 1.9		10
			Fil 6.2		10
V3	6SG7	2nd I.F. Amp.	PL 200		250
			SC 80		250
			K 1.8		10
			Fil 6.2		10
V4	6SG7	1st I. F. Amp.	PL 200		250
			SC 75		250
			K 2		10
			Fil 6.2		10
V5	80	Power Rectifier	PL 300		500
			Fil 4.9		10
V6	~~6B6~~ 6V6	Audio Output	PL 200		250
			SC 200		250
			K 18	B-	50
			Fil 6.2		10
V7	6SQ7	AVC Amp.	PL 80		250
			K 20		100
			Fil 6.2		10
V8	6C8G	Audio Squelch	PL 70		250
			K 85		250
			Fil 6.2		10
		Crystal Osc.	PL 185		250
			K 60		250
			Fil 6.2		10

No.	Type	Function	From	To	Scale Used
V9	6C8G	1st Mult.	PL 157		250
			K 50		250
			Fil 6.2		10
		2nd Mult.	PL 157		250
			K 52		250
			Fil 6.2		10
V10	9002	3rd Mult.	PL 210		250
			K 7.6		10
			Fil 6.2		10
V11	9002	1st Det.	PL 215		250
			K 2.5		10
			Fil 6.2		10
V12	9003	R. F. Amp.	PL 210		250
			SC 52		100
			K 1.6		5
			Fil 6.2		10

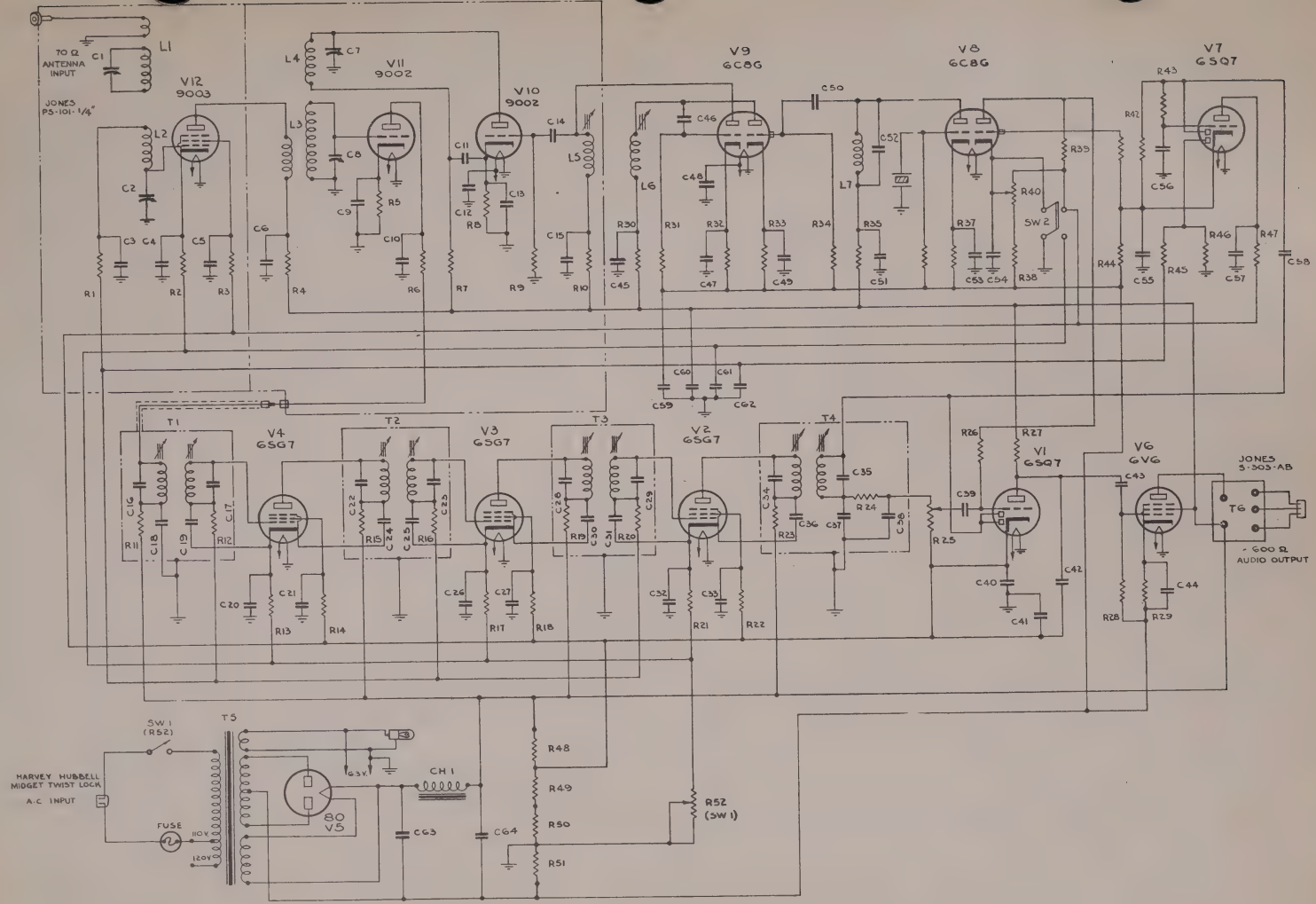


Fig. 1 - Type 201-A Receiver - Schematic Wiring Diagram

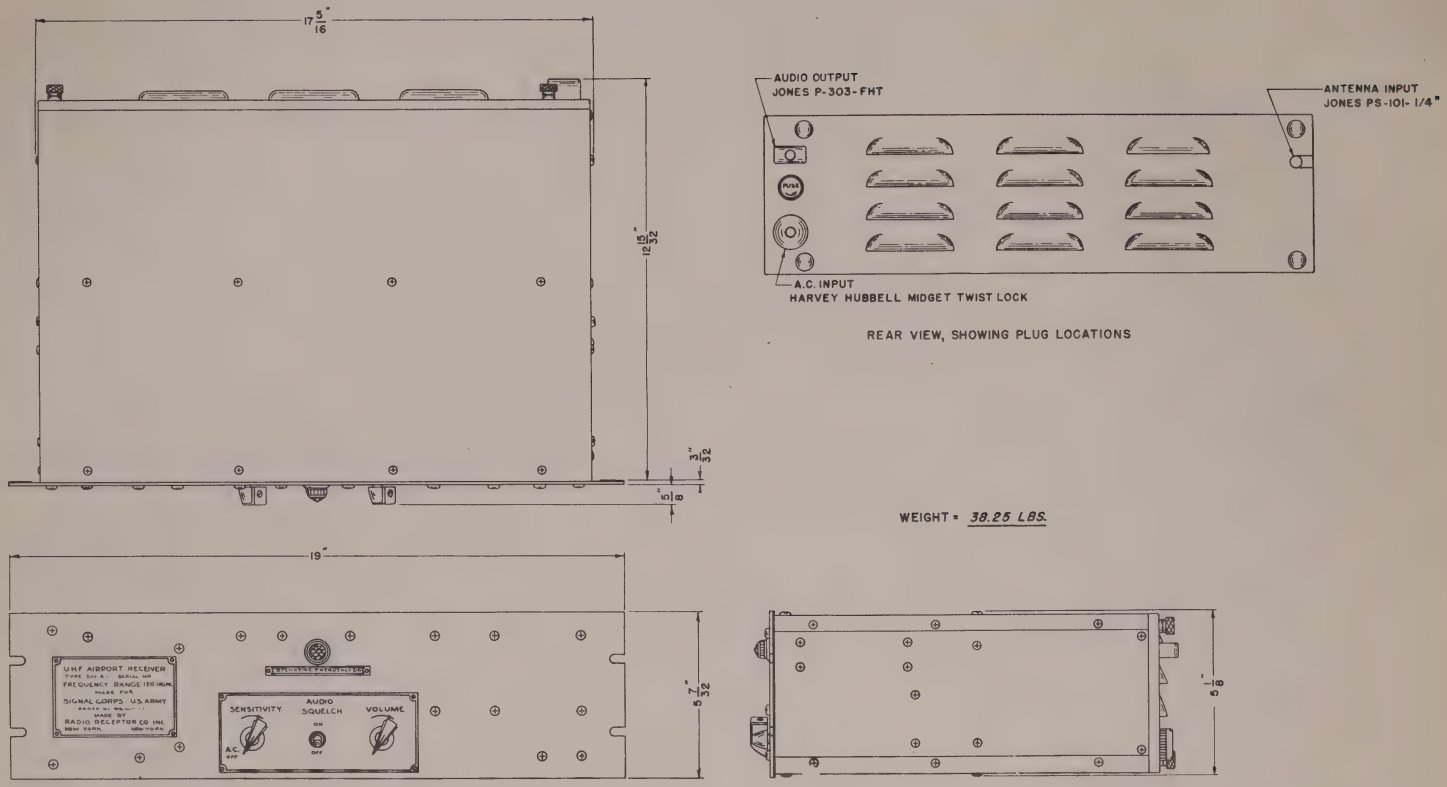
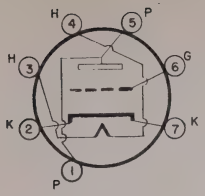


Fig. 2 - Type 201-A Receiver - Outline Drawing



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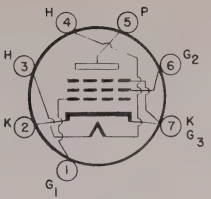

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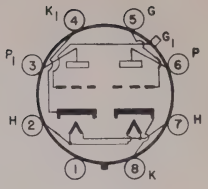
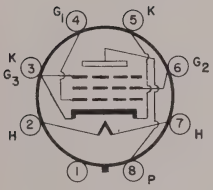
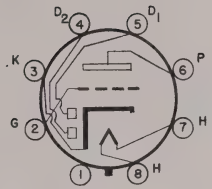


6C8G



6SG7



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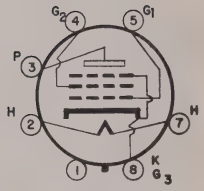
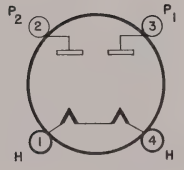


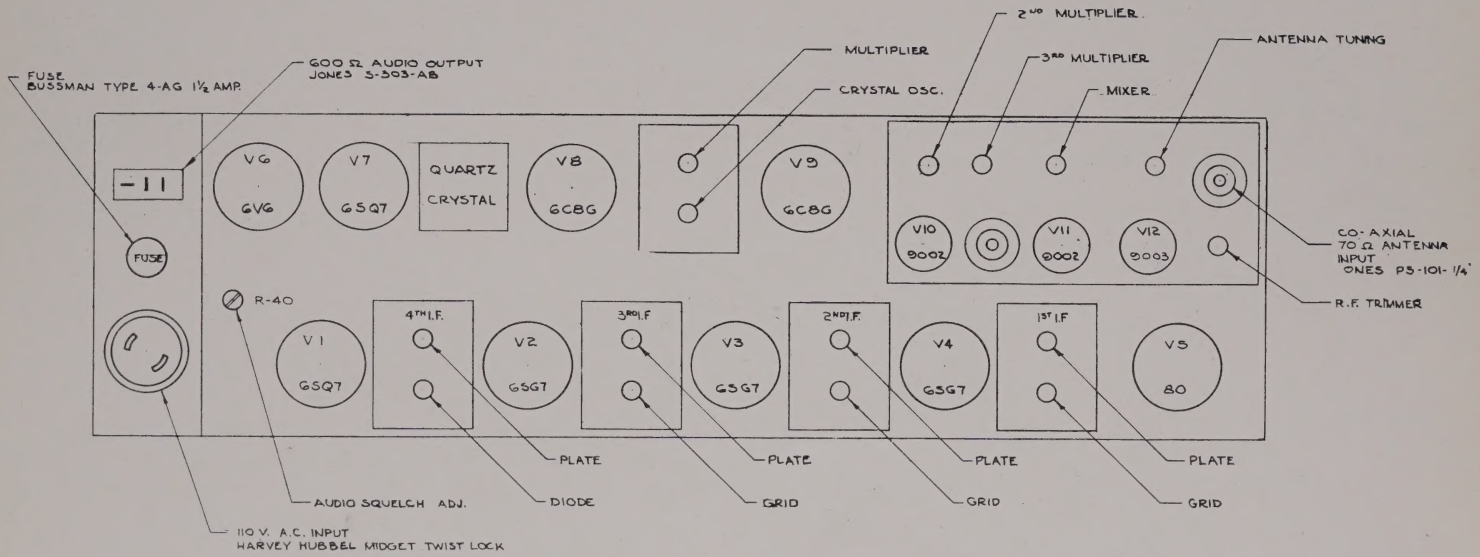
6V6



80

D_1, D_2 = DIODE PLATES
G, G_1 = GRID
G_2 = SCREEN
G_3 = SUPPRESSOR
H = FILAMENT (HEATER)
K, K_1 = CATHODE
P, P_1 = PLATE

Fig. 3 - Type 201-A Receiver - **Tube** Base Connections



NOTES
ALL TRIMMERS ARE AT D.C. GROUND POTENTIAL
USE FIBRE TUNING TOOL FOR U.H.F. CIRCUITS

Fig. 4- Type 201-A Receiver - Adjustment Diagram